ELECTRICAL REVIEW

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Storage Battery Explosions.

The explosion which took place on board Earl Poulett's steam yacht is by no means an isolated case, says our esteemed London namesake, and our readers will recollect the explosion on one of the Barking Road cars, which shattered all the windows into fragments. Fortunately no one has ever been injured by such accidents. and we are inclined to think that, as a rule, the force of these explosions is not sufficiently great to do more than split the receptacles, although the noise accompanying the action is loud enough to affect even the strongest nerves. These explosions never occur when the cells are open at the top and used in a well-ventilated place. The batteries were actually on the yacht's deck, where there should be plenty of air to carry off any hydrogen gas developed by over-charging; but the boxes were provided with lids having only a small vent hole, thus preventing a ready escape of gas, which might have been just sufficiently mixed with atmospheric air to produce disastrous effects when Lord Poulett struck a wax match and accidently ignited some of the escaping vapor, which speedily communicated heat to all the neighboring cells, and probably exploded the whole series simultaneously. This incident caused much alarm. A daily paper states that "electricians could in no way account for it, as it had hitherto been thought that under no circumstances could gas be generated." Mr. Reckenzaun tells us that he experienced explosions with covered cells, having vent holes, as early as 1882, also at different periods since then, but that neither he nor any one else had been seriously hurt, and that a sufficient supply of air, cells completely sealed, or quite open at the top, will be an efficient safeguard against mishaps of this description. Overcharging of storage batteries must evolve hydrogen, which, if accumulated in a close atmosphere, will produce one of the most explosive compounds when ignited. We give amongst our "Notes" the description of this little mishap, as the *Daily Telegraph* has it, but the reference to Earl Poulett's electricians is utterly absurd. His technical adviser knows perfectly well that under certain conditions such mishaps as the one under notice may occur, and the remarks of our gaseous contemporary are therefore quite uncalled for. It is more than probable that as the incident occurred some two months ago the memory of the narrator of this pretty story is at fault, but nevertheless we may point a moral to adorn the tale: Never allow these gases to accumulate, and don't search for free hydrogen with a lighted match.

The Man with a Patent.

Says the New York *Sun*: "There were only half a dozen people in the palace car all day long, and after dinner, when the man who had been sleeping and reading in seat No. 12 came over to me for a chat, I welcomed him with open arms. He said his name was Saunders, and that he had a patent or improvement on some part of a locomotive. He was going through to Cincinnati to have it perfected or adopted, or something of the sort. He had been in partnership with a mean man—a man who had tried to swindle him out of a fortune. To get even, he had stolen the patent and run away. He had it with him in a valise. That was all he said just then, but later on he confided to me the fact that at a town about 30 miles away this wicked partner of his might possibly be on hand to board the train and attempt to wrest the treasure from his keeping. He wanted my advice, and I offered to take charge of the valise. He thanked me with great effusiveness, and as we approached the town he shut himself into the smoking compartment.

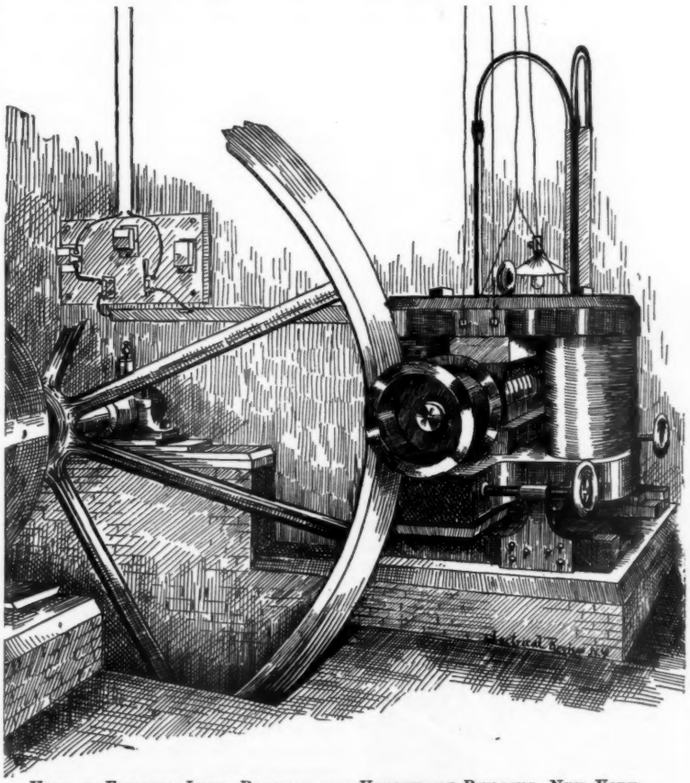
"As the train drew up I saw an old acquaintance on the platform, and while we were talking a posse was hunting the train for my friend. They didn't find him, as he had dropped off and struck out for the country. I went on to Cincinnati, taking his valise along, and although I was there four days he didn't show up. I arranged to leave it with the landlord, and it was carried to the office, to be opened by a meddlesome clerk. Instead of a patent, it contained wedges, drills, a brace, fuse, and other neat little devices for successfully working a burglar's job, and it cost me two days of the hardest kind of talk to satisfy the chief of police that I wasn't in it. I had ridden over 100 miles with a full-fledged burglar, and one who had made his mark, and I must say he was a better talker and more of a gentleman than any governor I ever met."

The new twin propeller steel gunboat "Concord" was recently completed at Chester, Pa. Among other modern improvements she is furnished with two Edison multipolar dynamos, and has about 250 incandescent lights. In addition there are two big search-lights, each of 800 candle-power.

The Electric Light Plant in the Vanderbilt Building.

The dynamo and engine room of the Vanderbilt Building, Beekman and Nassau streets, this city, is shown in our illustration on this page. Current for the lights in this large office building is furnished by a 450 light direct current Loomis dynamo. Power is obtained from a Pittsburgh engine of 50 horse-power, and transmitted to the armature by an Evans friction device. The fly-wheel of the engine is 10 feet in diameter, and runs 134 revolutions per minute; the Evans friction device is 18 inches in diameter, and the armature makes 952 revolutions per minute.

The Evans device has been in use about five months, making average runs of 11 hours per day. The engineer in charge is greatly pleased with it, and, in fact, with the whole plant. It is a neatly arranged and well kept dynamo room.



VIEW OF ELECTRIC LIGHT PLANT IN THE VANDERBILT BUILDING, NEW YORK.

Fire in an Electric House.

Stanley & Hall, electrical house furnishings, 32 and 34 Frankfort street, this city, had their stock damaged by water on November 5th. About 10.30 P. M., fire broke out in the top floor of the building, and in quenching the flames the firemen flooded all the floors with water. The damage to Stanley & Hall's stock will not exceed $500, fully covered by insurance. About half a day's delay in filling orders was caused, but no further delays are anticipated.

Texas Wants Capital Punishment—Electrical or Otherwise.

Several weeks ago, one of the REVIEW's reliable correspondents, in discussing electrocution, called attention to the fact there were 800 murders committed annually in Texas. Our correspondent resides in Austin, and, very naturally, this statement greatly excited the press and State officials of this big State, and an investigation was ordered which resulted in showing that our correspondent's figures were strongly substantiated by the records, and if murderers never brought to trial were considered, the total would probably exceed that number.

Since this statement appeared in the REVIEW our office has been flooded with marked copies of papers from all over the State of Texas, calling attention to murders and other crimes. From the number and extent of these we must confess the situation to be a very deplorable one, and it is evident that the best citizens are trying, by agitating the question, to bring about a change for the better. It is to be hoped they will be successful.

The following is from the Austin *Globe* of October 31st, 1890, and will give a fair idea of the feeling in Texas:

"There seems to be an epidemic of crime prevailing in our entire country just at this time. We can scarcely pick up a paper that our eyes are not at once directed to 'another bloody murder,' or 'a horrible wife butchery,' or 'another outrage,' and so it goes on day after day, and week after week. Crime seems to be abroad in the land, innocent women, mothers and wives are outraged and murdered in populous settlements in broad daylight, and nobody is punished; men are shot down in the court house in cold blood, and the murderer is let off with a few years' confinement; others are ruthlessly butchered and the offenders are turned loose.

"The fact is the ermine gown is too often worn by men of inferior ability, and by politicians, to be able to execute the laws as justice to society demands. The reasonable doubt is thundered to the jury in every case from the most atrocious murder down to the smallest misdemeanor, and instead of the traditional 10 guilty men escaping, 10,000 annually escape and are turned loose on society to again perpetrate their hellish deeds."

The Austin *Statesman*, in its issue of Oct. 26th, says:

"Gov. Ross' appointment of a distinguished lawyer to assist the local district attorney in the prosecution of the Eagle Lake assassins, shows an intention on the part of the administration to check the tide of crime which is doing so much to injure our State abroad. But judging from the usual course and results of criminal jurisdiction in this State, is there much probability that the Eagle Lake murderers will ever be punished? * * * * * * *

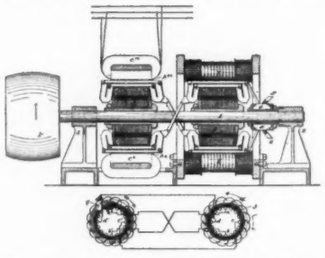
"The people of Texas cannot afford longer to wink at such outrages, and these Eagle Lake assassins, had they all the wealth of Crœsus of old, ought to have their necks broken on the gallows. That is the only way to stop such crimes, and if our juries can't or won't do it, it becomes a debateable question whether in capital cases the jury law hadn't better be modified or abolished altogether and jurisdiction of such cases be vested in a court of three or more judges appointed for life, beyond the influence of politics and at salaries that would render bribery impossible."

We have had many good words of commendation from the highest sources regarding our columns headed "Progressive Electrical Inventions."

PROGRESSIVE ELECTRICAL INVENTIONS.

BRADLEY'S IMPROVEMENTS IN ALTERNATING CURRENT MACHINES.

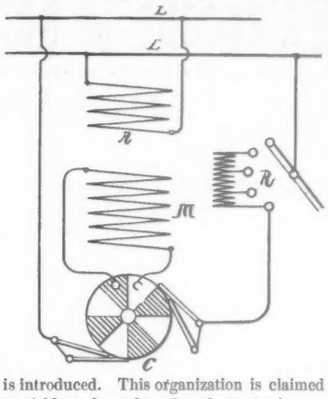
We illustrate herewith a new type of alternating current machine, invented by Charles S. Bradley, whose efforts in alternating current apparatus and other lines of electrical invention have been heretofore adverted to in the REVIEW. In the machine shown in the annexed engraving the design is to produce a high rate of alternation in a circuit by means of a comparatively low rate of speed of the generator spindle, or conversely to operate a motor at low speed under the influence of a current having a high rate of alternation. Considered as a generator, such a machine would offer the advantage not only of reducing the amount of wear and tear, but also of permitting the use of a commutator to create self-excitation of the field magnets, as only a small number of segments will be needed and the commutator will be



cheap and durable. Considered as a motor, the advantage of operating at low speeds for various kinds of work is self evident. The principle of the invention will be understood by inspection of the detached figure, in which are shown two ring cores about which are wound continuous Gramme coils; the coils of one ring, that shown to the right, are tapped at intervals and are cross-connected with the coils of the left ring, in such a way that any progression of the polar line in the ring 3 will, by the induced currents developed in its coil, react on the ring 9 and cause a progression of the polar line in said ring in a reverse direction, as indicated by the arrows. Applying this principle to an organized machine, on the spindle 1 in the main view are mounted two laminated cores 3, 9, which constitute the rotative members of the two machines. The coils of these rotative members are cross-connected, as shown, in a manner precisely analogous to the connection explained in relation to the detached figure. A series of field magnets, 7 and 8, co-operate with one of these rotative members, so that when power is applied to the pulley P, the field magnets are excited by a current flowing through a shunt around the armature 3, which current is commutated by the commutator 4. The progression of the polar line in the armature 3 with reference to the coils of said armature develops induced currents which are carried over to the armature 9 by means of the cross connections, and inasmuch as progressive travel of the polar line in said armature, by reason of the cross-connections, is in a direction reverse to that of the motion of the armature 3, it will be clear that the speed of polar travel with reference to the fixed coils c^{12} will be double the speed of rotation of the armature shaft 1, and that therefore, if said shaft rotate at a rate of 1,000 revolutions per minute, the polar line will travel at a rate of 2,000 revolutions per minute, and if there are six coils c^{12} arranged in inductive relation to this rotating part, there will be 6x2,000 or 12,000 alternations per minute. The terminals of the induction coils c^{12} are connected directly to the mains, and as these coils are fixed it is evident that no brushes are required for leading the current into the distributing circuit.

ALTERNATING CURRENT MOTORS.

In the accompanying engraving is illustrated diagrammatically a recent improvement in synchronous alternating-current motors, made by Messrs. Zipernowski, Deri & Blathy. The armature marked A is kept in continuous connection with the alternating current mains, and the currents flowing to the field magnets M are commutated so as to have a uniform direction. In order to avoid sparking, a pair of extra brushes are used, so that, for a definite time preceding each reversal of current, the field magnet coils are connected in a closed circuit by the brushes, through which closed circuit the extra currents, or those due to self-induction, discharge. This removes, to a large degree, the opposition of these extra currents to the supply current, and enables the field magnets to be maintained at a high strength with less current than heretofore. To prevent the supply current becoming too strong, a resistance R

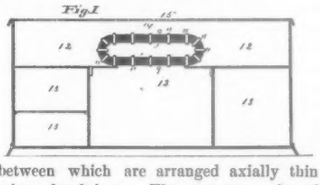


is introduced. This organization is claimed to yield good results when the motor is running synchronously. A laminated core is used for the field magnets and armature. In order to bring it into synchronism, one set of brushes is disconnected. The reversals of current affect both members of the motor alike, so that if started it will be kept in action at an increasing speed until synchronism is reached, when the other set of brushes is brought into service.

ELECTRIC HEATER.

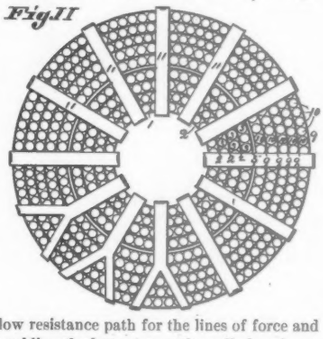
In the accompanying engraving is illustrated an electric heater, designed by Charles H. Talmage, of Kansas City, Mo. In Fig. I the heater is shown applied to a cook stove, and from Fig. II the structure of the heater may be understood. It comprises a series of concentric metallic tubes or cylinders,

Fig. I



between which are arranged axially thin wires of soft iron. There are two series of these metallic cylinders, and between them is placed a coil of copper wire designed to carry the heating current. The coil is so arranged that all may be cut into circuit or only a part included. The coil is connected up in circuit with a transformer, and alternating currents of sufficient heating volume are caused to circulate through it. These alternating currents induce currents in the metallic cylinders, the iron wires forming a

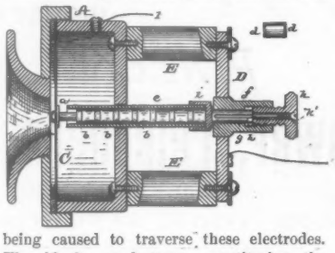
Fig. II



low resistance path for the lines of force and enabling the latter to cut the cylinders in an effective manner. These induced currents heat the wires and the cylinders, and the desired temperature may be produced by coupling the several copper coils in a suitable manner. The white bands marked 11, 11, are simply clamps to hold the parts of the device together.

THERMAL TELEPHONE RECEIVER.

In the accompanying engraving is illustrated an invention of S. Bergmann, of New York, showing how the thermal effect of electric currents may be applied to the reproduction of speech. The instrument comprises a diaphragm, carrying a central pin bearing against a series of electrodes contained in a glass tube *e*, the line currents



being caused to traverse these electrodes. The blocks or buttons constituting the electrodes are faced with tellurium, and are maintained in light contact by means of an adjusting screw *k* mounted at the rear of the instrument. Variation in the strength of the current passing on line produces variations in the amount of expansion or contraction of the tellurium, and imparts a vibratory movement to the diaphragm corresponding to the variations in strength of current circulating over the line. In order to produce an increased effect, additional means are provided for heating the electrodes so as to keep them at a constant normal point of expansion, thus enabling the current variations to produce changes above and below this point. The extra heating device may be a battery interposed constantly in the line, or even a lamp, the flame or heat of which is arranged to strike the electrodes.

ALTERNATING CURRENT ELECTRIC RAILWAY.

In the accompanying engraving we illustrate an electric railway system designed to operate under the influence of alternating currents, invented by Mark W. Dewey, of Syracuse, New York. The distinctive feature of the invention involves the idea of maintaining a completely closed alternating circuit along the line of way at all times, and of shunting by means of a counter electro-motive device, brought into action by the car, a sufficient amount of current through the motor, as it passes along the road, to propel the car or train. In the engraving A^1 represents an alternating current generator, which supplies a continuous closed circuit $B\,B^1$, B^1 forming a well insulated return conductor, and B having interposed at intervals a series of coils arranged cross-wise of the track and underneath the same; the current thus circulates over the conductor B, and

Fig. 1

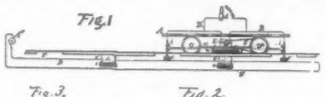
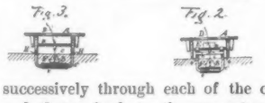


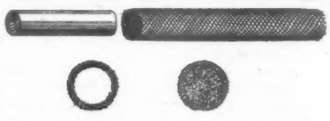
Fig. 3. Fig. 2.



successively through each of the coils *e e*, and thence back to the generator by conductor B^1. Each coil *e* is provided with an iron core e^1, bent at its outer ends and connected either to the track rails or to two auxiliary rails of iron within the track. It will thus be seen that each coil is provided with a core forming an open magnetic circuit, and that when the wheels of the car, as illustrated in Fig. 3, or two iron brushes, as illustrated in Fig. 2, ride upon the rails connected with any particular core e^1, a closed magnetic circuit is formed, either through the wheels and the axle of the car, or through the iron brushes and a laminated iron bar *n*. This closure of the magnetic circuit largely increases the self-inductive effect of the particular coil in service, and largely increases its counter electro-motive force, causing it to act as a choke coil, and practically shutting off the alternating current from that path; said current then passes through brushes $e\,e^1$, mounted on the car and through the motor. This action continues until the wheels or iron brushes leave the rail section forming part of the magnetic circuit, when they pass upon another rail section and develop counter electro-motive force in another coil. The forward movement of the motor, therefore, brings successive coils into action as counter electro-motive devices, thus continually forcing the alternating currents to pass through the shunt circuit containing the driving motor of the train. The counter electro-motive coils and the alternating circuit are preferably arranged in a conduit so as to render ordinary traffic at the surface safe.

BATTERY ELECTRODE.

A battery electrode designed for use in primary or storage batteries, has been patented by Messrs. Entz & Phillips. Oxide of copper is used as the depolarizing material, and is compressed within the meshes of the woven wire tube. The interior of the tube



may also be filled with the oxide of copper. In applying the depolarizing or active material to the tube, a core may be placed within the latter, and the active material compressed within the meshes of the wire tube, after which the core may be withdrawn. The device is illustrated in the accompanying engraving.

Visitors from Abroad are Treated to Some Electrical Wonders at Lynn.

A large delegation of visitors from the other side of the Atlantic, representing the Iron and Steel Institution of Great Britain, gazed with wonder and admiration at the electrical wonders which were laid before them recently at the large establishments of the Thomson-Houston Electric Company and the Thomson Electric Welding Company, in Lynn. The party arrived last week from Canada in three special cars.

When the train carrying the visitors reached Lowell it was met by Fred. R. Royce and C. H. Richardson, who represented the two above mentioned electric companies. These gentlemen accompanied the party to Boston, and on their arrival the visitors were taken under the protection of a reception committee consisting of James M. Meech, H. N. Sweet, H. C. Spaulding, P. L. Saltonstall and C. P. Davis.

Carriages were taken to Young's Hotel, where a lunch was served. After lunch the party was escorted to the Revere Beach and Lynn Depot, and a special boat conveyed the visitors to the station across the harbor, where a special train was waiting to receive them.

At West Lynn special electric cars were in readiness. These bore the delegation to the electrical works.

The first establishment visited was that of the Thomson Electric Welding Company.

There the visitors watched with great interest the various methods of welding iron, steel and copper by means of electricity. The processes were entirely new to all of the sightseers, for nothing of the sort has as yet been put into practical use outside of this country. It is understood, however, that an electric welding establishment is shortly to be started in England.

The adjacent works of the Thomson-Houston Electric Company were visited next, and all of the electric appliances therein were carefully and critically examined.

Included among those who inspected the electric works were: Vice-President Snellers, of the British Institution, accompanied by his wife and daughter; Mr. J. C. Simpson, Mrs. H. Glengon, Mr. J. H. Coghlan, Mr. Thomas, Mr. Isaac Butler, Mr. Charles Marston, Mr. Gustave Muller, Mr. R. T. Wilson, Mr. H. F. Craggs, Miss F. E. Craggs, Miss Craggs, Mr. Richard Laybourne, Mr. A. G. Service and wife, Mr. Jenks, Mr. H. G. Powell, Mr. Henry Banks, Mr. Hofer, Prof. Huntington and wife, Mr. Allen, Mr. M. Slater, Mr. Evans, Mr. J. F. Hobson, Mr. J. F. McLaren, Mr. O. R. Boyles, Mr. W. F. Jackson, Mr. and Mrs. Dickinson, Mr. and Mrs. Bantock, Mr. J. C. Ridley, Baron Archer, Mr. J. C. Tannett, Mr. Benjamin Marsden, Mr. Alfred Muir, Mr. Crowhall, Mr. Colquhoun, Mr. Joseph Gregory, Mr. Richard Williams, Mr. Paul Wilkes, Mr. W. Farnsworth, Mr. J. W. Sparrow, Mr. Edmund Butler, Mr. Jackson Smith, Mr. Henry Jones and Mr. William Waldron.

Curves of Magnetization and Permeability.

EXTRACT FROM CANTOR LECTURES, BY SILVANUS P. THOMPSON.

Joule expressed the opinion that "no force of current could give an attraction equal to 200 pounds per square inch," the greatest he actually attained being only 175 pounds per square inch. Rowland was of opinion that the limit was about 177 pounds per square inch for ordinary good quality of iron, even with infinitely great exciting power. This would correspond roughly to about 17,500 magnetic lines to the square centimetre. This value has, however, been often surpassed. Bidwell obtained 19,820, or possibly a trifle more. Hopkinson gives 18,250 for wrought iron, and 19,840 for mild Whitworth steel. Kapp gives 16,740 for wrought iron, 20,460 for charcoal iron in sheet, and 23,250 for charcoal iron in wire. Bosanquet found the highest value in the middle bit of a long bar to run up in one specimen to 21,428, in another to 29,388, in a third to 27,688. Ewing, working with extraordinary magnetic power, forced up the value in Lowmoor iron to 31,560, and subsequently to 45,350. This last figure corresponds to a traction exceeding 1,000 pounds to the square inch.

Cast iron falls far below these figures. Hopkinson, using a magnetizing force of 240, found the number of lines to be 10,783 in grey cast iron, 12,408 in malleable cast iron, and 10,546 in mottled cast iron. Ewing, with a magnetizing force nearly 50 times as great, forced up the value in cast iron to 31,760. Mitis metal, which is a sort of cast wrought iron, being a wrought iron rendered fluid by addition of a small percentage of aluminium, is, as I have found, more magnetizable than cast iron, and not inferior to wrought iron. It should form an excellent material for the cores of electro-magnets for many purposes where a cheap manufacture is wanted.

HYSTERESIS.

I have already drawn attention to the difference between the ascending and descending curves of magnetization, and may now point out that this is a part of a set of general phenomena of residual effects. The best known of these effects is, of course, the existence in some kinds of iron, and notably in steel, of a remnant of sub-permanent magnetization after the magnetizing force has been entirely removed. To this retardation of effects behind the causes that produce them the name of "hysteresis" has been given by Prof. Ewing.

Another kind of after effect was discovered by Ewing, and named by him "viscous hysteresis." This is the name given to the gradual creeping up of the magnetization when a magnetic force is applied with absolute steadiness to a piece of iron. This gradual creeping up may go on for half an hour or more, and amount to several per cent. of the total magnetization.

Another important matter is that all such actions as hammering, rolling, twisting and the like, impair the magnetic quality of the annealed soft iron. Annealed wrought iron, which has never been touched by a tool, shows hardly any trace of residual magnetization, even after the application of magnetic forces. But the touch of the file will at once spoil it. Sturgeon pointed out the great importance of this point. In the specification for tenders for instruments for the British postal telegraphs, it is laid down as a condition to be observed by the constructor, that the cores must not be filed after being annealed. The continual hammering of the armature of an electro-magnet against the poles may, in time, produce a similar effect.

FALLACIES AND FACTS ABOUT ELECTRO-MAGNETS.

I will conclude this lecture by stating a few of the fallacies that are current about electro-magnets, and will add to them a few facts, some of which seem paradoxical. The refutation of the fallacies and the explanation of the facts will come in due course.

Fallacies.—The attraction of an electro-magnet for its armature varies inversely as the square of its distance from the poles.

The outer windings of an electro-magnet are necessarily less effective than those that are close to the iron.

Hollow iron cores are as good as solid cores of the same size.

Pole-pieces add to the lifting power of an electro-magnet.

It hurts an electro-magnet (or, for that matter a steel magnet) to pull off the keeper suddenly. (It is the sudden slamming on that in reality hurts it.)

The resistance of the coil of an electro-magnet ought to be equal to the resistance of the battery.

A coil wound left-handedly magnetizes a magnet differently from a coil wound right-handedly. (It is not a question of winding of coil, but of circulation of current.)

Thick wire electro-magnets are less powerful than thin wire electro-magnets.

THE BRADNER HANGER.—MCCREARY ELECTRICAL SPECIALTY CO., N. Y.

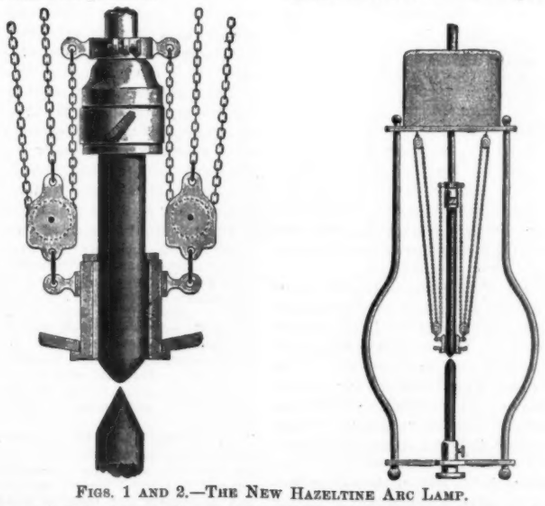
A badly insulated electro-magnet is more powerful than one that is well insulated.

A square iron core is less powerful (as Dal Negro says, eighteen-fold!) than a round core of equal weight.

The attraction of an electro-magnet for its keeper is necessarily less strong (one-third according to DuMoncel) sideways than when the keeper is in front of the poles.

Putting a tube of iron outside the coils of an electro-magnet makes it attract a distant armature more powerfully.

Facts.—A bar electro-magnet with a convex pole holds on tighter to a flat-ended armature than one with a flat pole does.



FIGS. 1 AND 2.—THE NEW HAZELTINE ARC LAMP.

A thin round disk of iron laid upon the flat round end of an electro-magnet (the pole end being slightly larger than the disk) the disk is not attracted, and will not stick on, even if laid on quite centrally.

If a flat armature of iron be presented to the poles of a horse-shoe electro-magnet the attraction at a short distance is greater, if the armature is presented flankways, than if it is presented edgeways. On the contrary, the tractive force in contact is greater edgeways than flankways.

Electro-magnets with long limbs are practically no better than those with short limbs for sticking on to masses of iron.

The Bradner Adjustable Hanger.

There are a number of inventions for regulating the height of an incandescent lamp, but the subject of our illustration possesses the prime advantage of every useful invention—simplicity.

This device consists of a suspended differential pully enclosed in a neat brass shell. The flexible cord is wound several times around the large drum passed through an opening and around the small drum, the lamp and shade being perfectly balanced by the weight of the pulley. The lamp will remain in any position between ceiling and floor. Should the lamp and fixture be heavier than the pulley alone there are small weights provided with each pulley, made to fit a recess in the large end of the pulley, and by inserting one or more of these weights the balance can easily be made perfect.

The Bradner hanger is made in three sizes adapted to all incandescent lamps, from single pendants up to cluster or chandelier lights. The McCreary Electrical Specialty Company, 18 Cortlandt street, this city, are agents for this section of the country.

The Hazeltine Arc Lamp and Carbon Attachment.

Our illustrations on this page show the Hazeltine arc lamp and attachment to increase the life of the carbon. The shield or tip is attached, preferably, to the upper carbon near the arc, and by an ingenious device is made to feed coincidentally with the carbon, thus maintaining its relative position to the arc.

It has been demonstrated by many tests that the use of this device causes the carbons to last about twice as long as when burned without the attachment. Just what the action of the shield or tip is, and why it accomplishes what it does, the inventor is unable to state. It has been suggested that the shield may confine in proximity to the arc the combustible gases set free by the consumption of the carbon in the arc, and that these gases contribute to the light-giving power of the arc, while the shield protects the carbon from gusts and drafts, thus prolonging its life. The shield does not affect the light given by the arc.

The saving in carbons also decreases the cost of trimming about 50 per cent. this being the experience of the Municipal Company, of St. Louis. The accumulation of carbon dust in the globes is greatly diminished by the use of the tip, which also serves as an automatic cut-out and prevents the carbon holders from burning out. The device may be attached to any arc lamp. It is controlled by the Hazeltine Electric Company, of St. Louis.

The Thomson-Houston Motor Company, Boston, has recently issued a very excellent map with statistics calling attention to their system of electric power transmission. The map is of the State of Massachusetts, and, while not for general distribution, is to be sent to large manufacturers in New England. It is a neat and interesting thing to send out.

Sioux City, Ia.—The Spencer Electric Light Company; capital, $8,000.

Fenton, Mich.—The Fenton Electric Light and Power Company; capital, $10,000.

Port Angeles, Wash.—The Washington Electric Light and Motor Company; capital, $25,000.

Watseka, Ill.—The Royal Electric Company; capital stock, $6,000; incorporators, L. F. Watson, M. S. Taliaferro and D. W. Arnold.

Potsdam, N. Y.—The Lake Meacham and Malone Telegraph Company; capital, $2,000. Trustees, A. R. Fuller, O. B. Fuller and M. E. McClary.

Boston, Mass.—The W. S. Hill Electric Company; capital, $500,000, with $125,000 paid in. President, Warren S. Hill; treasurer, Philip L. Clark.

Altoona, Pa.—Among the new corporations chartered at Harrisburg last week was the Fairview Electric Passenger Railway Company, of Altoona, with a capital of $40,000.

Chicago, Ill.—The People's North Shore Street Railway Company has been formed, with a capital of $200,000. The incorporators are, Alexander Clark, Benjamin F. Hill, Jr., Henry F. Daly and Joseph H. Fitch.

Chicago, Ill.—The Adjustable Incandescent Light Joint Manufacturing Company, at Chicago; to manufacture incandescent light joints; capital stock, $50,000. Incorporators, John Long, Cornelius Gaffney, M. F. Clark.

Pittsburgh, Pa.—Oakland Square Electric Light Company, of Pittsburgh, with a capital of $10,000, and as directors, Edward C. Godfrey, Thomas H. McGowan, John A. Steel, George W. McClure and James A. Reed, all of Pittsburgh.

Louisville, Ky.—The Gooch Electric Light Company, Louisville, Ky. The general nature of the business proposed is to manufacture and sell electric light, heat and power; to establish a plant and acquire all necessary patents, franchises and rights for such purposes. The incorporators are, W. T. Grant, J. J. Harrison, Graham Macfarlane, Abner Harris, Dexter Belknap.

Montreal, Que.—Messrs. J. P. Dawes, Henry Joseph, R. D. McGibbon, Chas. Cassils and E. N. Sanderson, the latter of New York, are applying for letters patent to be incorporated under the name of "The Suburban Electric Company," with a capital stock of $25,000. The object of the company is to establish stations for the supply of electric light and power.

The Funicular Electric Railway.

The funicular electric tramway between Pazzalo and Lugano has lately come into operation. The line is close upon a mile long, and runs along the shore of the Lake of Lugano and up Mont Salvatore. Power is obtained from a water-fall which actuates two Girard turbines, each of which drives a dynamo. One of these machines is an alternator, and supplies lights at Lugano and Pazzalo. The second dynamo is a continuous current machine, and gives 1,800 volts and 22 amperes at 700 revolutions; the motor at Pazzalo develops 40 horse-power at the same speed. The maximum gradient is one of 38 per cent. The track being double, a car is attached to either end of the cable, so that the tractive effort required is considerably reduced. Each car weighs 4½ tons, and can carry 32 passengers. A 50 horse-power steam engine is kept in reserve at Pazzalo.

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The use of electricity in mines is becoming more general and wide-spread every day. In coal mines it is used quite largely to operate tram cars and machinery underground. It is very evident that the day is not far distant when electricity will supply a large proportion of the light and power used in mines.

Some French physicists are said to be studying methods for forecasting storms and earthquakes by means of certain noises heard in telephones. This is a somewhat novel application of the telephone, and in the neighborhood of an electric railway, or even of a telegraph line, we should scarcely think it would give satisfactory results. Details of the scheme, however, are not yet to hand.

It appears that in spite of the horrors surrounding the recent accident on the electric railway at Florence—which was due to the inexperience of an underpaid motorneer—the popularity of the road has by no means diminished. There has been no public panic, as prophesied by many foreign papers which published lurid accounts of the accident; the service was resumed at once and the road is unable to accommodate the traveling public, so greatly in demand are the electric cars. It is to be hoped that the company is employing better trained men to take charge of the cars.

The cable cars in Chicago have added another to the long list of victims for whose deaths they are responsible. If cable traction on Broadway ever becomes an accomplished fact, the casualties in New York will probably far exceed those in Chicago. It is earnestly to be hoped that when horses are abandoned on the surface railways in New York they will be substituted by electric motors, and not by the unwieldy, dangerous and unsatisfactory cable.

Comparatively speaking, Summer is the dull season for the electrical man. The Autumn is given over, for the greater part, to conventions and exhibitions. From the latter we are just recovering and making our approach to the Winter, the season of solid business and hard work. In the Springtime we have openings and preparations for future conquests. This year we are coming to the Winter's business with an earnest, silent, get-there air, which speaks well for all concerned.

An electric railway has recently been opened at Salzbourg, in Switzerland, which is practically an electric elevator, as it ascends the peak of Ronchberg, a great tourist resort, the incline being at an angle of nearly 70 degrees. Between the two terminal points of the line there is a difference of level of about 250 feet. A battery of 116 accumulators, manufactured by the Oerlikon Company, placed at the lower station, operates an electric motor installed at the head of the line. The motor hauls a car which weighs over half a ton and carries 12 passengers. We believe this is the first example of a funicular railway operated by electricity, but in these days electricity climbs up mountain sides as easily as it delves into the bowels of the earth in mines.

Prof. Langley, with the aid of the bolometer, has measured the heat radiation of the light of the glow-worm. He states that the light given by this highly scientific insect is accompanied by less than one four-hundredth part of the heat given by an equal amount of gas light. This means that the light of the glow-worm is four hundred times more economical of energy than gas light, and also vastly more economical than the electric light. Professor Wm. S. Anthony has prophesied that "possibly we may discover the secret of the glow-worm and fire-fly, and substitute electric for the insect energy. I know it will take several fire-flies to equal a 16-candle lamp, but it will also take a good many fire-flies to develop a horse-power. But although I do not see at present any practical solution of the problem, I repeat, I believe the problem can and will be solved."

GUTTA-PERCHA.

It appears that there exists a serious risk of the extermination of the plant or tree from which gutta-percha is obtained. This gum is used in many industries, but principally in the manufacture of submarine cables, as it is capable of sustaining its insulating qualities when submerged under water at great depths, in fact, the insulation of gutta-percha actually improves with age when kept continually under water. The disappearance of the curious tree from which gutta-percha is obtained would, therefore, be a calamity of world-wide importance, yet it would appear from a report recently made to the French Academy of Sciences that we are actually threatened with such a calamity. The French Government, recognizing the importance of possessing an intimate knowledge of the source of supply of this precious material, entrusted to M. Sérullas, a distinguished scientist, the task of exploring the Malayan Archipelago, which is the home of the *isonandra-gutta*, with a view to studying the peculiarities of the tree and methods employed in cultivating it and extracting the gum.

M. Sérullas spent three years in Malay and studied the *isonandra* in all periods of its existence, acquiring a complete knowledge of its natural history and physiology; but he reports that there is absolutely no method in the manner employed by the natives in robbing the tree of its sap, and that no effort is made to cultivate and propagate so valuable a member of the plant-world. The natives adopt the wholly barbarous custom of cutting a tree at the roots in order to extract the gum; thus each tree only gives one yield and is then dead for ever. No wonder gutta-percha is rapidly getting to be worth its weight in silver. We would suggest to our British cousins, who are probably the largest consumers, that the simplest way out of the difficulty would be to annex the Malayan Archipelago and place the cultivation of the *isonandra* on a scientific basis.

PROPOSED MODIFICATION OF THE GERMAN PATENT LAW.

In 1886, the German Imperial Federal Council ordered the appointment of a commission to make investigations preliminary to an intended revision of the German patent law of May 25th, 1877.

This commission was appointed by the imperial chancellor, and the result of its inquiries was favorable to the projected modifications of the law.

The project has for its purpose the improvement and completion of the existing law by modifying it and adding rules and definitions which, in practice, have been found desirable.

Among other changes, the following subjects have been considered: Priority of former applications, the right of a patentee to prohibit products made according to his patented process, payment of the fee of issue prior to the grant of the patent, payment of penalty when the tax is not paid at the proper time, payment of a fee by the petitioner for declaring a patent invalid, regulation of the rights in Germany of foreign patentees, postponement of the announcement of application of exposure to public inspection of the papers pertaining to the application for three months after the patent office has provisionally accepted the application.

Section 12 of the proposed law, treating of the rights and duties of foreign patentees, is as follows:

A non-resident can obtain a patent and enjoy the rights thereof only by appointing a representative in the country. The latter has power to represent the patentee in the steps required by this law to be taken, and also in suits at law relating to the patent. Suits against the patentee must be brought before the court of the district in which the representative resides, and, in default of such, before the court of the district in which the patent office is situated, in the sense indicated in Section 24 of the civil procedure.

A foreigner is not allowed to apply for a patent and to enjoy the rights thereof, when, according to an advertisement published in the imperial law journal (*Reichs Gesetzblatt*) by the Chancellor of the Empire, it appears that German subjects are treated in a more unfavorable manner than the subjects of any other State in the State to which such foreigner belongs.

The proposed modifications in the organization of the imperial patent office are also of interest, especially worthy of mention being the rules concerning the appointment of permanent jurisprudent and technical officers, and the formation of separate divisions for applications for letters patent and for patents against decisions rejecting applications. Hitherto the division for applications belonging to one class was, at the same time, the division for protests in cases belonging to another class. It is also intended to introduce the verbal procedure in the first examination of applications, but with certain restrictions. It seems, also, desirable to introduce, in general, verbal procedure in cases of appeal, so that applicants may be allowed, on motion, to make personal explanation.

According to the projected law, in future it will be allowed to lodge a motion for declaring a patent invalid only within five years after the grant of the patent, when the motion is based on default of novelty.

In future not only whoever knowingly, but whoever carelessly, makes use of a patented invention will be bound to indemnify the injured party.

The proposed new patent law has been published, says the "U. S. Consular Reports," in order to afford to any interested person the opportunity to express his opinion about the projected modification before they are considered by Parliament, which will probably be in about a year.

As already announced, the publication of the *News Letter* of the National Telephone Exchange Association has been discontinued. General C. H. Barney, the secretary of the Association, edited the *News Letter* with care, but with all the electrical journals in the field it hardly had a place. Telephone men the world over are learning to depend upon the ELECTRICAL REVIEW for news of interest to them.

CORRESPONDENCE.

OUR BOSTON LETTER.

Mr. Geo. L. Wiley, of the Standard Underground Cable Company, New York, was in this city a few days during the present week.

Mr. G. W. Hebard, general manager of the Sawyer-Man Electric Company, of New York, arrived in town Wednesday last.

Mr. Frank N. Sanderson, of the firm of Strout, Sanderson & Company, electrical contractors, Worcester, Mass., was a visitor among the Hub's electric supply houses this week.

Mr. D. C. Spruance, of the Star Electrix Company, Philadelphia, was on a flying business visit to this city early in the week.

Mr. P. H. Alexander, of Alexander, Barney & Chapin, New York, made a short sojourn among his electrical friends in this city during the week.

Mr. Walter I. Thurston, of the Providence Electrical Supply Company, made a business visit among the electrical interests of this city on Friday.

Mr. F. O. Rusling, special agent of the Connecticut Motor Company, favored this office with a visit on last Wednesday, accompanied by Mr. Roswell P. Smith, the Boston agent of the company named.

The Simplex Electric Company, of this city, whose well known brands of wire are used everywhere, has just received an order for 150,000 feet to be used in the lighting of the Hoosac tunnel. Some remarkable and successful tests have recently been made with these wires.

The Holtzer-Cabot Electric Company, of this city, has supplanted its steam plant by an electric plant to run all the shafting and machinery in its Brookline factory. The primary power was derived from a 10 horse-power engine, which will be substituted by one 25 horse-power and one 3 horse power Eddy motor. The factory will be enlarged by the addition of two stories, all 20x25 feet, to be used for the polishing and plating department. An Eddy dynamo of 2,000 lights capacity will be installed next week to light the entire building. Mr. C. W. Holtzer, the senior officer of this enterprising company, has fully recovered from the injuries received by the serious accident met with while riding in his carriage a few weeks ago.

Mr. A. T. Starkey, who has been connected with the railway department of the Sprague Electric Railway and Motor Company, in New York, has been appointed to a position in the New England District of the Edison General Electric Company, of New York. He will devote his time principally to railway work in this district.

Mr. H. B. Cutter, the well-known Philadelphia electrician and Pennsylvania agent of the Standard Electric Company, of Vermont, was in this city last week.

The Standard Electrical Supply Company, of this city, has taken the agency for the electric light switch manufactured by Mr. O. H. Platt, of Bridgeport, Conn. General Manager Wm. C. Woodward, has appointed another active and experienced business man to the company's electrical department, Mr. H. W. Chase.

The Warren S. Hill Electric Company has been incorporated in Portland, Me., and will do business in Boston. It is intended to manufacture and place on the market a new type of motor, specially designed by Mr. W. S. Hill, the well-known inventor, and they will be made directly under the personal supervision of the inventor. A large and completely equipped factory is to be established at once, and so satisfactory has been the record already made by the few machines of this type now in regular service, that there is every prospect of an extensive and lucrative business being speedily built up. Mr. Hill has identified himself with several prominent financial men who are prepared to do business on an extensive scale.

Erie Telegraph & Telephone has declared a quarterly dividend of one per cent., payable November 17, to stockholders of record, November 8; books close November 8 and open November 17. The report of the quarter ending September 30, 1890, shows for Cleveland Telephone Company, Northwestern Telephone Exchange Company and Southwestern Telegraph & Telephone Company, as follows:

	1890.	1889.	1888.
Gross	$195,903	$178,526	$168,361
Op. expenses	*135,792	109,813	109,054
Net	.....	68,713	59,307
New construct.	.....	10,098	8,847
Balance	60,111	58,615	50,460
Dividends	48,000	48,000	36,000
Surplus	†12,111	10,615	14,460
Subscribers ad'd	276	138	283
Total Subscrib's	12,938	11,702	11,030

* Includes dividend on Bell company's stock.
† Includes $7,821 surplus of sub-companies, a portion of which belongs to the Bell company.

The Jewell Belting Company has recently filled orders for several electric light stations, and most of these orders came to the company unsolicited. The Jewell Company has also filled a contract for the entire belt equipment of the power stations of the Toledo, Ohio, Street Railway Company, and the Rochester, N. Y., Street Railway Company.

The Mosher Arc Lamp Company, of Chicago, has appointed Mr. Theo. Mosher, of Meriden, Conn., general eastern agent, this territory including the New England States, New York, New Jersey and Pennsylvania. I had the pleasure of meeting Mr. Mosher while on a recent visit to the factory of the Mather Electric Company, at Manchester, Conn. At the time one of the Mosher arc lamps—which burns on an incandescent circuit—was undergoing several "cast iron tests" under the impartial supervision of Prof. Wm. A. Anthony. The tests were successfully made and on a circuit of very high voltage, and so well pleased was Prof. Anthony that he unhesitatingly wrote off the results of the tests, and, at the same time, complimenting the Mosher arc lamp in very high terms. The lamp gave a steady and clear light without any hissing and scarcely any flicker. W. I. B.

Boston, Nov. 8th, 1890.

OUR CHICAGO LETTER.

Mr. George Cutter has resigned his position of general manager of the Great Western Electric Supply Company, and rumor has it that he will accept a position soon with the Brush Company. Mr. H. P. Lucas, who is well known to the electrical fraternity, has been appointed to succeed Mr Cutter.

The Central Electric Company are sending out a novel and unique circular letter which is a *fac-simile* of a letter received by the above company from the J. A. Cook Lumber Company, of Minneapolis, in which they state that they enclose a piece of Okonite wire taken from the walls of the Lumber Exchange after having been buried and constantly used for five years. The wire does not show its use one particle, and looks as if it had been taken from the reel but yesterday. The enterprising Central Company received all of the wire taken out of the above building, and a small sample is fastened to each circular, held in place by a neat red ribbon.

J. Lang & Company are at work on a new catalogue, which will contain much of interest to the electrical trade. The above company has recently finished and delivered some very large switches for the Chicago Edison Company.

It is Expected that the Cicero and Proviso Electric Road will be in operation within ten days. This will give the suburban residents direct communication with the Madison street cable road.

McDougal & Cummings, western agents of the "C. & C." Motor Company, report the following recent sales: C. R. Miller, seven horse-power for running elevator; *Saturday Blade*, 15 horse-power; Phillips Coal Company, Mystic, Iowa, 40 horse-power generator for operating coal cutting machinery. The above agents have also sold 12 horse-power in small motors within the past 10 days.

The Many Friends of Payson K. Andrews will be pleased to learn of his appointment as western agent of the J. G. Brill Car Company, of Philadelphia, Pa.

Mr. N. S. Possons, who for the past eight years has been superintendent of the Brush Company, of Cleveland, Ohio, as we before stated, has accepted the position of general manager of the Belding Motor Company, of Chicago. This company have recently increased their capital stock to $2,000,000; have also purchased 10 acres of land, with factories, within six miles of the post office; they have purchased $50,000 worth of machinery, and work is being rapidly pushed on their new buildings. It is expected that the factory will be in full blast within 60 days, with a capacity of five 20 horse-power street car motors per day. The company report the closing of a number of prominent contracts. Harold P. Brown has been appointed electrical engineer of the Belding Motor Company.

Prof. Badt, who for some time past has been connected with the Edison General Electric Company in their Chicago office, has accepted the position of manager of the power transmission department of the Thomson-Houston Electric Company.

Wm. Hood, western manager of the Accumulator Company, of New York, will place next week one of his company's storage battery cars on the line of the North Chicago Street Railway Company. The car will be run from Dearborn Station to the Northwestern Depot *via* Dearborn, Kenzie and Wells streets.

The Sunbeam Incandescent Lamp Company will remove the factory to No. 66 Ogden place, November 8th. The company's capacity will be greatly increased in their new factory.

The Knapp Electrical Works are now mailing their new catalogue to the electrical trade; it is complete in every detail. This company promise something new in the annunciator line. Great claims are made for it.

Personal.—The following well-known gentlemen have within the past ten days honored Chicago with a visit: E. R. Gilman, St. Paul; C. C. Warren, New York; C. H. Brampton, Cedar Rapids; R. T. McDonald, Ft. Wayne, Ind.; Thos. Clohesey, Kansas City, Mo.; M. L. Stern, Denver, Col.; J. E. Talbot, Ft. Wayne, Ind.; C. M. Romberg, Dubuque, Iowa; G. M. Brill, Philadelphia, Pa.—S. A. Barton, of the Thomson-Houston Company, was in the city last week visiting his many friends, who are glad to see the improvement in Mr. B.'s health.—C. C. Warren has resigned from the Westinghouse Company.

The Western Power Construction Company report the closing of a number of large contracts recently. D. B. D.

Chicago, Nov. 8th, 1890.

ELECTRIC CLUBS.

New York Electric Club.

The Regular Monthly Meeting, which occurs November 20th, on which occasion the lecture season will be opened with a lecture by Professor E. L. Nichols, of Cornell, promises to be one of the most largely attended meetings of the Club. Prof. Nichols proposes to point out the nature of certain limitations which seem to preclude the hope of any very marked improvement in the efficiency of our present method of lighting; then to discuss the properties of certain sources of light, not made use of at present, with the view to the more or less remote possibility of their development as practical illuminants. Some original work never as yet published, together with the collation of various researches which have not attracted general attention, taken singly, but which seem to Prof. Nichols to be significant, will be included in the presentation, and the whole will be shown by aid of lantern slides. The lecture will be a popular one, and will be an interesting addition to the study of the problems connected with electric lighting.

At a Recent Social Gathering at the Club House, Superintendent Frank C. Mason, of Brooklyn, related his adventures with a camera. During a summer vacation of several weeks he took with him a Kodak, and captured 100 (as he thought) very interesting and valuable views. On his return, when the Kodak was opened, it was found that just one out of 100 was recognizable, and that one Mr. Mason had taken in his office before he departed. Any one who says "Kodak" to Mr. Mason is sure of a treat. Yet no one blames the camera.

The Question of Having a Regular Dinner at the Club once a month in addition to the regular monthly lecture is looked upon with favor, and will probably be inaugurated early in December. Thursday night of each week at the present time is the Club night, and is once again being largely attended.

A Number of Life Members have recently been elected upon payment of $500. Among these are F. W. Roebling, Thos. A. Edison, O. E. Madden, E. T. Gilliland, H. L. Storke, Henry C. Davis and Theo. N. Vail.

The Lecture by Professor Nichols on "The Artificial Light of the Future" will occur Thursday evening, November 20th. Members who expect to be present that evening for dinner have been requested to notify the clerk at the Club, so there will be no delay in service.

Recent Out of Town Visitors were: Vesey F. Butler, Habana, Cuba; H. E. Irvine, Boston; A. E. Warner, Boston; Thos. M. Hart, New Bedford; C. L. Tolles, Hartford; W. C. McIntire, Philadelphia; Warner J. Steel, Philadelphia; W. A. Case, Buffalo; Fred. De Land, Chicago, and Gen. A. W. Greeley, U. S. A.

Chicago Electric Club.

The Regular Meeting of the Chicago Club was held in its parlors, on Tuesday evening, November 4th, and was largely attended. The minutes of the last meeting were read by Secretary Kreidler. These included the resolution passed at the last meeting raising the dues of resident members to $40 per year, non-residents to $20, and initiation fee to $50. A special assessment of $10 on each resident member was made. This, it was claimed by the board of managers, would relieve the Club of all indebtedness, and, by the collection of all dues outstanding, would give a balance in the treasury of $1,700.

Mr. B. E. Sunny, chairman of the committee appointed on new quarters, reported that the committee as yet had done nothing of an important nature, but were diligently working on the matter. It is the intention of the Club to secure, if possible, quarters that will give them twice the floor space.

The paper by F. E. Degenhardt, on "Underground Electrical Work," was one of the most interesting ever read before the Club, and brought forth a lengthy discussion, in which the following gentlemen participated: President F. G. Beach, B. E. Sunny, Professor John P. Barrett, General A. K. Stiles, and Messrs. Lovejoy, Meany, Day and Kempt.

Professor Barrett's remarks were especially interesting. He told of his early experience in underground work for the city of Chicago, the obstacles encountered, and how they were overcome.

The figures taken from statistics and given by Mr. Degenhardt were a great surprise to many, showing a most wonderful growth in underground work in Chicago since 1888.

Mr. Lovejoy, who is a member and director of the Boston Electric Club, gave a very interesting talk relative to the growth of his Club and its expenses.

At the close of the discussion on Mr. Degenhardt's paper, it was found to be so late that it was decided that the reading of Mr. Theodore P. Bailey's paper, on "Street Railways," be postponed until the next meeting.

Boston Electric Club.

Prof. Elihu Thomson delivers an address before the Boston Electric Club this week. The meeting will undoubtedly be largely attended, and the lecture a valuable addition to electrical literature. No man in the electrical profession stands higher in point of successful accomplishment than Professor Thomson, and withal he is a very modest and unassuming gentleman. We understand that Professor Thomson has been invited to deliver an address before that very select New York organization, the Union League Club, and if he consents, the Union League members have an interesting and instructive evening to anticipate.

Wisconsin Electric Club.

At a Meeting of this Club, held at its rooms, 80 and 81 Loan and Trust Building, Milwaukee, on October 30th, Mr. Alexander Bevan read a paper on "Storage Batteries." His conclusions were that the storage battery had not fulfilled the hopes of its promoters, though great activity was being shown in efforts to bring it to perfection. This was evidenced by the fact that no less than 4,000 patents had been taken out on storage batteries. He thought it likely that the storage battery of the future had not yet been invented. The Club looks forward to a very interesting and instructive Winter season, as a programme, including 12 papers on the important electrical questions of the day, has been prepared.

The National Electric Light Association.

At a meeting of the Executive Committee of the above Association, held at the Electric Club, New York City, November 7th, the following business was transacted:

1. The date for holding the Thirteenth Convention was fixed for February 17th, 18th and 19th, 1891.

2. Eugene F. Phillips, of Providence, was appointed chairman of a committee of five on reception and arrangements, with authority to appoint the other members of the committee.

3. Gen. C. H. Barney, of New York, was appointed chairman of a committee of three on electrical exhibits and transportation, and to appoint the other members of the committee.

4. The committee on papers made a report, and stated that they expected to secure two or three more important papers besides those promised. The committee has not only secured the promise of these papers, but has gone a step further, and named a person to open the discussion on each paper. This will bring out the best points of the topic, and greatly add to the interest and value of the proceedings. Papers promised are as follows:

"How Can the National Electric Light Association Best Serve the Central Station Interests?" by C. R. Huntley. Discussion by A. M. Young.

"Distribution of Steam from a Central Station," by F. H. Prentiss. Discussion by Geo. H. Babcock.

"Distribution and Care of Alternating Currents," by T. Carpenter Smith. Discussion by G. H. Blaxter.

"The Ferranti System," by C. B. Haskins. Discussion by C. L. Edgar.

The resignation of Mr. James English as a member of the Executive Committee was accepted, and Mr. Edward A. Leslie, manager of the Manhattan Electric Light Company, of New York city, was elected to fill the vacancy.

Telephonic News

*** Roanoke, Va., has 150 telephone subscribers.

*** A telephone exchange with 50 subscribers has been put in at Grand Forks, North Dakota.

*** Telephone lines in the southern part of California are being extended so as to connect a number of additional towns.

*** There are now about 25,000 telephones in use in Canada, of which more than 20,000 belong to the Bell Telephone Company.

*** Mr. Chas. A. Davis has been appointed manager of the Montgomery, Ala., Telephone Exchange, vice R. H. Polk, transferred to Savannah.

*** The telephone exchange at Xenia, O., has moved into new and improved quarters. There was no delay in the service in making the change.

*** The Erie Telegraph and Telephone Company has declared a quarterly dividend of one per cent., payable November 17th to stockholders of record November 8th.

*** An extension of 60 days' time has been granted the Bell Telephone Company, at Rochester, N. Y,. in which to complete their underground work and remove overhead wires.

*** The Telephone Company has consented to take down the poles it erected on Jones street, between Eleventh and Fourteenth streets, Sioux City, Iowa, in deference to the wishes of the citizens.

*** Bristol, which is located part in Virginia and part in Tennessee, wants a telephone exchange, but as these two States belong to different licensees of the parent Bell Company, the citizens are having difficulty in making arrangements.

*** Telephone exchanges in connection with the Toledo, O., system have just been placed in these surrounding towns: Ada, Anna, Cridersville, Delphos, Findlay, Kenton, Lafayette, Lima, North Baltimore, Piqua, Portage, Sidney, Van Wert, Wapakoneta—all in Ohio.

*** The Executive Committee of the National Telephone Exchange Association having decided that it is undesirable to continue the publication of the *News Letter*, the present number will be the last issue. Gen. C. H. Barney, the secretary of the association, has made the *News Letter* of interest and value in the past.

*** The case of the Cincinnati Telephone Company against the Mt. Auburn Single Trolly calls up some history of the telephone company. This company has had less changes in its management than any other large corporation in the city in the same time. For 12 years the late Colonel A. D. Bullock, president; John Kilgour, secretary, and Chas. T. Dickson, treasurer; have composed the executive committee. W. H. Eckert, for a short time manager, was succeeded by the present manager, Captain George N. Stone. The holdings of the large stockholders are about the same now as in the formation of the company. Recently the Hon. W. S. Groesbeck became one of the largest stockholders by the purchase of a large block of stock of President Bullock. The unanimous election of Henry Hanna to the presidency greatly strengthens the corporation.

THEY ALL SAY SO.

THE OPINION OF A PRACTICAL ELECTRICIAN.

To the Editor of Electrical Review:

Enclosed please find subscription for one year. I consider that the Electrical Review is the representative electrical paper of this country.

Yours, etc.,

W. G. Wright.

Newark, N. J., Nov. 5, 1890.

Some Principles of Writing Telegraphs.

BY GEO. EVARISTE MORSE.

(Written for the Electrical Review.)

Writing telegraphs *per se* must be held to consist solely of devices in which a pen or stylus is made to traverse a surface and form characters directly, in obedience to electrical influence, although I shall presently describe a form in which the writing is made in a different way. In the former type the problem of transmission consists in giving to a pen a lateral and longitudinal movement, and composing the two forces to produce a movement of the pen as in writing, as will presently be made clear. These forms are comparatively recent, since formerly the usual way was to form the characters piecemeal by breaks in the current. The instruments for this latter method consisted of some sort of a metallic surface adapted to be traversed by a metallic stylus. The stylus or pen was made to rule parallel lines across the plate, in the manner of a fine shading, so near together that for all practical purposes the entire plate was traversed by the stylus. The plate was connected to ground through a battery, and the stylus was connected to a line wire. At the distant end of the line wire was a similar stylus made to move over a metallic plate in all respects similar to the plate just described. It will be thus seen that a circuit would be established from ground at one end to plate, stylus and line wire, to stylus at distant station, through the plate to ground. The styli were actuated by clock-work to move in unison so as to be each on the same relative part of its own plate at the same time, so that if a break in the current were made, both pens would be on the same spot on their plates.

Having given these theoretical conditions, *fac-simile* transmission may be effected by the following method: The message to be sent is written on tin foil with insulating ink, and the tin foil is spread upon one of the plates, which arrangement constitutes the transmitter. On the other plate (the receiver) is spread a paper saturated with a conducting solution which will be decomposed by the passage of a current. The pens are started together and circuit is completed through the apparatus. Each time the receiving pen crosses the paper, it rules a white line by the action of the current, discoloring the paper which passes under the point. When the transmitting pen crosses any part of the message, the insulating ink will interrupt the current and the discoloration of the receiving paper will thus be arrested as long as the transmitting pen runs on the ink, and the clear portions will thus be a copy of the insulating ink. These portions will show as writing by breaks in the

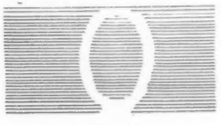

Fig. 1.

continuity of the lines. Fig. 1 will serve to illustrate a received message. In this figure, it will be observed that each of the lines ruled across is broken at one or more points, and the breaks have a blank space, which, in this case, is in the form of the letter O. The discoloring action of a current is not the only means for writing, as any means by which the breaks in the current will be recorded will answer.

The earliest inventors used a flat plate, or, as in the pantelegraph of Casselli, a plate of small curvature. Latterly, the most common surface for the style to run on is that of a cylinder, since it can be given a motion of rotation, and the pen can, at the same time, be given a motion of translation, and thus trace a line over every portion of the surface.

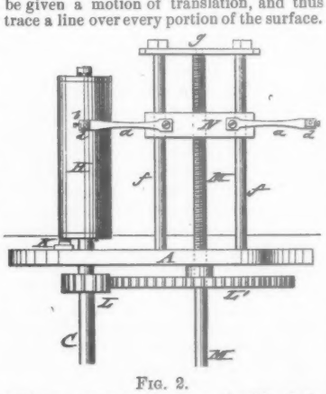

Fig. 2.

Such an apparatus is shown in Fig. 2 in which H is a metallic cylinder mounted on a shaft C; *d* is the pen or style mounted on an arm *a*, attached to a block or carriage N. A screw-shaft M, is threaded through N, and is actuated by a large cog-wheel L^1, which meshes with a small cog L, on the cylinder shaft C; *f f* are guides upon which the carriage rests. A revolution of the shaft C will cause the cylinder to rotate, and at the same time cause the carriage N to move longitudinally, so that a continuous line will be traced over the cylinder, so as to practically cover the whole surface. The arrangement of tin foil and receiving paper is the same as in the flat surfaces. The circuits through the pens and cylinders are also arranged in a similar manner. As long as the cylinders rotate synchronously the writing will be an exact copy, but when the cylinders run apart the lines will be irregular and distorted.

Quite an ingenious device slightly different from all these, is described in patent to Denison No. 315,392. In this improvement the paper sheet and foil are replaced by a ribbon of each of these materials, which is made to pass under a stylus carried or operated by the armature of a polarized relay so

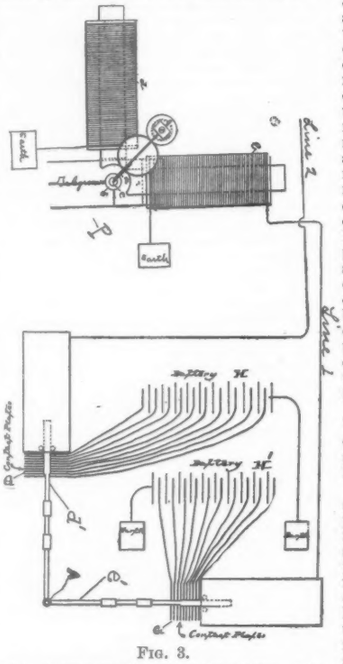

Fig. 3.

as to vibrate rapidly across the ribbon. The styli are caused to close a local circuit at each extremity of their paths. In this circuit are the magnets which feed the paper. The principle of transmission of the writing is similar to that in the other cases, only instead of using insulating ink the transmission is effected directly by the ridges and depressions in the foil made by the operator in writing the message. The polarized relays which operate the styles are in the same line, and are thus operated synchronously by the same impulses. This form of apparatus has many advantages. The writing is done on a continuous strip, and the only difficulty is to make the foil and paper in the respective instruments to feed forward at the same rate of speed.

In all these systems the operating parts of both the receiving and transmitting instruments must move synchronously, or else, as has been previously pointed out, the breaks will occur when the pens are not on the same relative part of their plates, and the writing will be irregular and distorted. This holds equally good for a cylinder or a moving strip, as will be understood. The requirement of synchronism is thus seen to be mandatory. In the earlier forms, where the plate was stationary and the pen movable, the apparatus was run by clock-work, either released or actuated by a pendulum. The swing of the pendulums was regulated by their length, and as often as one ran ahead of the other it was automatically stopped and held until the other completed its swing, when both were released together. (See Bain, No. 5,957.) One of the simplest means for synchronizing the cylinder form of apparatus, such as is shown in Fig. 2, is described in patent 148,938 to De Hondt. The cylinders are rotated by step-by-step movements (pawl and ratchet), actuated by polarized relays. The polarized relays are all in series, and pole changers serve to reverse the current. It will thus be seen that the relay tongues will all vibrate synchronously and rotate the step-by-step mechanisms all in the same time. Denison's method has already been referred to in connection with the description of his apparatus. To synchronize his instruments, it will be remembered that his polarized relays, carrying the pens, are all in the same circuit, and they both complete their swing at the same instant, in obedience to the same current; and simultaneously local circuits which feed the paper one step. Both paper and pen at both stations are thus made to move in unison.

In many of the apparatus of these types this condition of synchronism, being difficult to maintain, more than any other contributed to unsatisfactory and inefficient operation. Again the time consumed was of some consideration, and efforts were made to perfect an apparatus which would trace directly the writing by a pen which would follow the movements of a transmitting pen. As I have before stated, this was done by composing two forces working at right angles upon a suspended pen. A typical form of such a device is shown in Fig. 3.

The receiving instrument consists of an iron stylographic pen, *abc*, suspended in front of two magnets, *d* and *e*, placed at right angles to each other. When the transmitting pen A is in its initial position, the point of *abc* rests upon the center of a circle made by the concave fans of the pole-pieces of the magnets *d* and *e*, each of these magnets *d* and *e* is in a separate circuit through lines 1 and 2, and batteries H^1 and H in each of which batteries wires are led from each cell to contact plates G insulated from each other. The rod d^1 governs the circuit of magnet *d* and the rod e^1, that of *e*. The operation is as follows: A movement of the pen A will cause either or both of the rods to move in one direction or the other, moving its brush over the contact plates, and these proportionately changing the current on the lines to correspond with such motion, thus causing the receiving magnets *d* and *e* to change their attraction for *abc* to correspond with this changed condition. Responding to this *abc* will take up a new position, tracing a line on the paper, which, since the current in each line has been changed in direct proportion to movement of the transmitting pen, will be found to be an exact copy of the motion of A. Under the receiving pen is a moving strip of paper *p* upon which the writing appears in correct form, but each character must be traced upon the same ground in the transmitter.

It is obvious that equally good results may be obtained by keeping the battery power constant, and varying an adjustable resistance in the same manner as the battery power has been done in this case.

One inventor (Patent No. 407,692) dispenses with the use of rods in his transmitter by placing insulated contact strips 5–15, connected to resistance 4–14, side by side (as shown in Fig. 4), and writing with a double pointed pen (shown to the left), one point resting on one set of contacts, and one on the other, each being in circuit with a different line and magnet. The course of the current through one side or leg of the apparatus is as follows: From ground through battery (not shown), wire 3, resistances 4, contact plate 5 (according to location of pen), pen point 6, wire 7, to line 2. On the other side ground, battery wire 13, resistance 14, plates 15, pen point 16, wire 17, to line 1. The arrangement of lines and receiving magnets being the same as in the former case. A movement of the pen laterally will cause one point to cross the strips on the right (as shown) half of the contact table, and vary the current in one line and magnet, while the other point will slide along on one strip on its side and will not alter its own circuit. A longitudinal movement will cause the other point to cross the left side of the contact table, while the first point slides along a single strip. A movement of the pen as in forming a letter will cause both points to traverse their tables, cutting resistances in or out proportional to such movement, each producing a proportionate effect on its own receiving magnet, and will thus, as in the former case, cause the receiving pen to reproduce the movement of the transmitting pen. In this case it will be observed that the battery power is kept constant and an adjust-

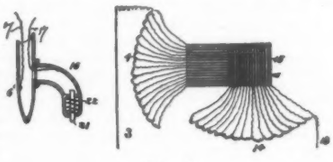

Fig. 4.

able resistance varied, as has been pointed out above.

In order to receive a greater range of movement of the receiving pen, it is often mounted on rods (see Fig. 5) in the same manner as the transmitting pen in Fig. 3. The instrument then becomes a page writer, and the moving strip is dispensed with. A common method of actuating this species of receiver is to have the rods attached to the cores of the magnets, which are made to slide into the coil under the influence of the current, and are pressed out; usually by springs (see Dolbear's instrument, *Scientific American*, June 14, 1879, page 376). Dolbear, however, uses a moving strip, as in the other cases. Having thus described some forms of apparatus in which the writing is

done over two lines (or two sides, as they may be called), by *varying* the current in each side to correspond to the lateral and longitudinal movement, I shall proceed to describe a more recent apparatus in which the work is done by a rapidly vibrating current of uniform strength. There remains a third principal form in which the current is both varied and broken. In this form only one wire is used. Space, however, will not permit of description and illustration. Such a system is shown in Patent No. 405,339 to Dewey.

Gray's apparatus (No. 386,814) is shown in Fig. 5. The transmitter is on the left, and the receiver is on the right, of said figure. B and C are tables of alternate conducting and insulating segments, the insulating segments being shown as black. Such an arrangement is known as a sunflower. A trailer, 12, is shown as bearing on the tables. The trailers are each connected to a battery and ground, and in each table the conducting segments are all connected to a live wire. Fig. 5, however, actually shows but one segment so connected, but they are all connected together, which answers the same purpose. It will thus be seen that when the trailer is rotated rapid breaks in the line current will occur, as often, indeed, as the trailer crosses an insulation segment. Current passes to line when a conducting segment is crossed. From the pen A, cords 59 run to hubs on the shafts of the trailer. A movement of the pen in any direction will cause more or less of the cord to be unwound from the hubs, and will cause the trailers to rotate and break the current, as has been described. A retractile spring 15, in each case, serves to rotate the trailer in the opposite direction, when the pen approaches the trailer. The movement that I have just described being supposed to take place when the pen is made to recede and pull on the cord. Pole-changers (not shown) reverse the current when the trailer moves backward. Separate wires, lines 1 and 2, run from each sunflower to pole-changers and receiving magnets. Magnets C^1 being in the circuit of line 2 and sunflower C, and B^1, in the circuit of line 1 and sunflower B. The use of pole-changers I and J, will presently be made plain when we come to consider the operation. An enlarged view of one set of receiving magnets is shown in Fig. 6. In this figure, 21 is a pin-actuating rod, of which there are two, placed at right angles to each other (see Fig. 5), as in the other cases. The magnets H^1, H^1 and H, H are in separate circuits, and actuate the oppositely placed pairs of armatures 15-16 and 5-6, which are pivoted at 24 and 22, and serve to move the rod in one direction or the other, by gripping it and moving it

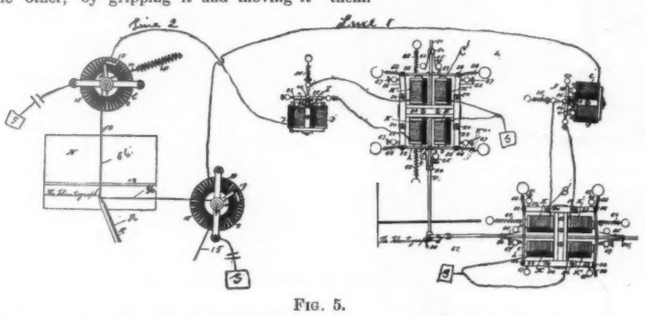

FIG. 5.

when they are drawn up to the poles of the magnet. In the figure, 5-6 are shown as drawn up and 15-16 as retracted. Only one set of magnets (as H, H) is in circuit at one time, a pole-changer in line (I in case of C^1 and J of B^1) serving to switch the current through one or the other set, accordingly as the trailer, in response to the motion of the transmitting pen, is moving in one or the other with respect to the sunflower. Each make and break causes the armatures to be drawn up to the poles and released, causing a step by step motion of the rod in one direction or the other, according to the magnets which are in circuit, which will, of course, depend upon the direction of rotation of the trailer, which in turn depends upon the direction of motion of the transmitting pen.

To illustrate the co-operation and function of all these parts, let me take the apparatus as organized in Fig. 5 and assume a suppositious case in which the pen is caused to trace a horizontal line from right to left. As this is done, the cord 56 rotates the trailer 12 over sunflower B, and the current over line I will be rapidly broken. It is obvious that the breaks will be proportional in number to the length of the line traced by the pen, and in rapidity to the rapidity of motion of the pen. This current is transmitted over line I and the pole-changer 1 switches it through magnets K^1 (which correspond to H^1 of Fig. 6), and the effect described for Fig. 6 will take place. A similar action will occur in line 2, if the transmitting pen be made to trace a vertical line from top to bottom. If now the motion of the transmitting pen, in either case, be towards instead of from the trailer, as I have supposed, the tension of spring 15 will rotate the trailer in a direction opposite to its previous motion, and the cord will, at the same time, operate pole-changers to reverse the polarity of the current, which will serve to cause the pole-changers at receiving station to switch the current through the lower set of magnets (H H or K K, according to side), and cause the receiving pen to be drawn in the direction of the magnets, which is the direction of motion of the transmitting pen. If, now, a diagonal line be traced, both trailers will be rotated, and both sets of receiving magnets will be operated to draw the pen in a diagonal line to correspond with the motion of the transmitting pen. It is plain that if

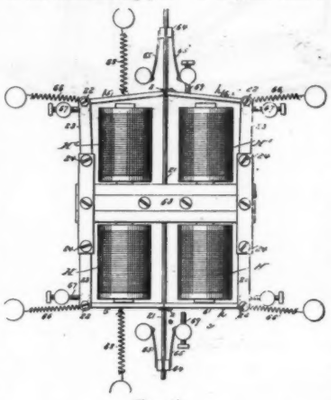

FIG. 6.

the transmitting pen be caused to move in a curved line, or trace a letter, each cord, trailer, line and magnets, constituting one side, will do its own proportionate amount of work on its own side, and the motion of one pen will be a copy of the motion of the other.

I have thus attempted to trace the development of the art without reviewing the comparative merits of individual methods. Many systems, of course, have not been noticed to avoid encumbering the article with long and useless descriptions of unimportant improvements. It may be said, however, that these several leading systems may be taken as the principal ones. The publications and patented inventions are for the most part analogous to or improvements of them.

Secondary Cells.

BY W. J. S. BARBOUR-STARKEY.

The author, in this paper, limited himself to a description of his own experiences in regard to secondary cells, primarily with a view to provoke discussion on the subject. Soon after the introduction of M. Faure's cells, his attention was drawn to the hard film of sulphate of lead formed on the plates, which materially interfered with their efficiency; and, as a result of experiments, he ascertained that the addition of a small quantity of carbonate of soda to the dilute acid served to remedy this evil, even when the cells were allowed to remain idle for a considerable time. Subsequently, in the case of a small installation of 22 E. P. S., 350 ampere hour cells, the plates of which showed signs of sulphating, carbonate of soda (ordinary washing soda) was added in small quantities, and on proceeding with the charging the plates were restored to their original condition. The cells thus treated have since been in use for a period of five years, and are now in perfect condition. The subsequent experiments on this subject by Mr. Preece were then alluded to. The author advised that large cells be used for stationary work, and that they be both charged and discharged at low rates. Various details in regard to the management of cells were discussed, the practice of packing the plates in a solid though porous mass formed by mixing plaster of Paris and sawdust, being specially recommended.

Western Union Victory.

Judge Dennis, of the Circuit Court at Baltimore, filed his opinion on October 31, dismissing the bill filed against the Western Union Telegraph Company, for a receiver for the Western Telegraph Company, and for an account. The Western Telegraph Company's line extends from Baltimore to Wheeling, along the route of the Baltimore and Ohio Railroad. It was built by the railroad and turned over to the telegraph company.

Subsequently the Western Union Telegraph Company, representing the majority of the stockholders of the Western Telegraph Company, united with minority stockholders in an effort to take possession of the line away from the Baltimore and Ohio Telegraph Company. The Western Union Company withdrew from this arrangement when it became possessed of the Baltimore and Ohio Telegraph system, whereupon the minority stockholders of the Western Telegraph Company instituted proceedings against the Western Union Company. Judge Dennis says:

"I am of the opinion that the license to the Western Telegraph Company, to erect and maintain a line of telegraph within the limits of the right of way of the Baltimore and Ohio Railroad, under the agreement between the two companies, dated June, 1853, expired by its own limitation on the 4th of February, 1877, when the charter of the Western Telegraph Company was surrendered and a new charter to the Western Telegraph Company of Baltimore City, was obtained, and that under Articles 9 and 11 of that agreement, both the right of possession to and property in the physical structure of the line was lost to the Western Telegraph Company from that date."

Counsel for the minority stockholders say they will carry the case to the Court of Appeals.

Edison Toy Manufacturing Company.

The annual meeting of the Edison Toy Manufacturing Company was held at Clarence Hale's office, in Portland, Me., October 30th. Mr. Edison was represented by his secretary, Mr. Tate. This was the treasurer's exhibit September 30th:

LIABILITIES.

Capital stock	$1,000,000.00
Working capital	62,871.37
Total	$1,062,871.37

ASSETS.

Treasury stock	$160,000.00
Licenses and patents	846,894.84
Cash	2,973.03
Cost of dolls' parts and merchandise	35,384.23
Edgar S. Allen, general manager	69,025.00
European expense account	5,609.84
Thomas A. Edison	1,000.00
Office furniture	1,229.18
Total	$1,062,871.37

These officers were elected: Directors, Benjamin F. Stevens, Daniel Weld, John W. Mackintosh, Winfield S. Hutchinson, Thomas A. Edison, George Borgfeldt, Oscar E. Madden; clerk, Clarence Hale; treasurer and secretary, Daniel Weld.

The Trouve Electric Erygmatoscope.

At a recent meeting of the Académie des Sciences, M. G. Trouve described an electrical appliance devised by him to facilitate the inspection of the geological strata pierced by the boring tool. The apparatus consists of a powerful incandescent lamp enclosed in a cylinder. One of the hemi-cylindrical surfaces of this cylinder constitutes the reflector; whilst the other, which is of thick glass, allows the luminous rays to pass through it and light up the successive strata through which the lamp descends. At the base of the instrument there is an elliptical mirror, while the top is open, so as to enable an observer placed at the head of boring and armed with suitable glasses to see on the mirror the reflected image of the stratum illuminated by the lamp, which is arranged so that its upward rays are intercepted. The whole apparatus is suspended from a cable formed by the two conducting wires. This cable is wound on a drum, the trunnions of which are insulated from one another, and connected to the leads, current being obtained by two rubbing contacts attached to the poles of a portable battery. This arrangement enables the instrument to be raised and lowered without difficulty and without interrupting the observations. The erygmatoscope, as at present arranged, gives excellent results down to a depth of over 600 feet, and with a more powerful lamp it could be used at still greater depths. An expedition which has been sent out to the Mozambique coast by the Portuguese Government, to search for coal beds and other mineral deposits, has been supplied with erygmatoscopes.—*Invention.*

TELEGRAPHIC

.... Telegraph rates on the Postal Company's lines in the West have been reduced.

.... The Postal Telegraph Company has reduced their rate from Pueblo, Col., to Kansas City, St. Joe and Council Bluffs, to 50 cents per 10 words and three cents additional, day messages. For night messages, 30 and two cents.

.... Senor Diez de Bonilla, of the mercantile house of Bonilla Hermanos, which extends throughout Mexico and Central America, arrived in San Francisco last week. It was through this well known house that Minister Mizner transmitted all his secret dispatches to Secretary Blaine, during the Barrundia affair. The Bonillas are associated with the Mexican Government in the management of the National Telegraph System. There is a cable extending from La Libertad, in San Salvador, to San Jose de Guatemala. During the recent war between these countries the Salvadorians refused to transmit dispatches by this cable, and Guatemala retaliated. The Bonillas own the lines which lead to Mexico, where they join the National Telegraph System. In the disturbed condition of Central American States much of the news and diplomatic dispatches must be transmitted in cipher. This was the case in the Barrundia affair. Senor Bonilla is exhibiting to his friends a letter of thanks which he has just received from the Secretary of State in Washington.

Pendulum on the Eiffel Tower.

A gigantic pendulum has been suspended from the center of the second platform of the Eiffel Tower. It consists of a bronze wire 380 ft. long, with a steel globe weighing about 198 pounds at the end. Its object is to exhibit the rotation of the earth by the Foucault method.

Conductivity of Solid and Fused Salts.

The data hitherto published on the conductivity of solid and fused salts differ for each salt when determined by different observers. The author (L. Gatz) was extremely careful to keep the salts at constant and accurately measured temperatures. The salts were fused in a small porcelain crucible 2.8 cm. high and 2.2 cm. diameter, heated equally in a sand bath. In the salt were placed stout, square, platinum electrodes of 2.25 square cm. surface. The electrodes were freshly platinized before each test. To prevent cooling of the electrodes by conduction of heat through the connecting wires, about 20 cm. of the latter were also put in the same bath. The resistance of the salt was measured by the alternate current and an electro dynamometer. The capacity of the crucible was determined by a solution of magnesium sulphate. All readings were taken with decreasing temperatures.

In spite of the fact that many of the salts on solidifying showed porosity, a general agreement was found between the results for the same salt in the solid and fused state. With some salts, just at the point of fusion, a remarkable change occurs in the volume or in their conductivity; with others, the conductivity alters rapidly at a temperature below the fusing point, and with a third group, a steady change only is observed. It appears, therefore, that the only difference between salts in the solid and fused state is due to an action of an electrolytic nature, as Warburg has already proved in the case of glass and crystal. Clausius' theory, therefore, that in solid bodies the molecules oscillate about a position of equilibrium, but cannot separate from their own group, cannot be accepted. The idea of a sharply defined difference between solids and liquids must also be abandoned, as it seems to have no existence in Nature. Liquid molecules exist in every solid, even when the latter show no approach to the softened state.

* * It is proposed to build an electric road from St. Louis to St. Charles, Mo.

* * Siam is to have a $40,000 electric railway, 30 miles long. It is cheap for the length of it.

* * The Prince of Wales, on November 4th, opened the first electric railway in England, running from the city of London under the Thames to South London.

* * A company has been organized in Petersburg, Va., for the preservation of the battle-fields near that city. An electric railway to Petersburg will be one of the improvements.

* * Milwaukee capitalists are interested in building an electric motor line from Kenosha to Racine and to Milwaukee. The entire run from Kenosha to Milwaukee could be made in 45 minutes.

* * The power house of the Duquesne Traction Company, at Ben Venue station, on the Pennsylvania Railroad, is rapidly approaching completion, and will soon be ready to put in the machinery. The work on it has been progressing very satisfactorily, though the rainy weather somewhat interfered with its progress. This road promises to be one of the most valuable in Pittsburgh.

* * The street railway business of the Westinghouse Electric and Manufacturing Company is increasing in the same manner which has shown itself in the alternating current electric lighting work. The department is occupied day and night to its full capacity, and the motors are now expected to be turned out soon as rapidly as they are demanded. Springfield, Ill., is the latest road in operation with the Westinghouse electric motor system.

Electricity in Street Cars.

Two young electricians were disputing, as they rode on an Albany motor car the other day, as to whether they were in an electric field or not. One strenuously insisted that no electric current passed through the car, and urged that all the fluid went underneath the floor. "I will prove it otherwise," replied the other, as he drew a bunch of keys from his pocket. Tossing his keys on the floor, he nodded to his friend to pick them up. He did so, but found a perceptible resistance. Another part of the floor was tried, and it was clearly shown that a strong electric current was passing through the floor. "Well," he remarked as he handed the keys back to his friend and removed his watch to his upper pocket and buttoned his coat, "I believe it now."—*Albany Express.*

The youthful "electrician" was easily satisfied. We fear he has donned his title as most of his kind don a silk hat—too soon. There is a slight difference between a magnetic field and the current which produces it.

Favorable Reports of the Burton Electric Heater.

The Burton Electric Company, of Richmond, Va., have placed their electric heaters on electric cars in St. Louis, Kansas City, Joplin and Sedalia, Mo.; Denver, Col.; Omaha, Neb.; Des Moines, Iowa; Indianapolis, Ind.; Lynn, Mass., and other places, and the reports so far received of them have invariably been favorable.

They have also been placed in the elegant private car of the Short Electric Railway Company, of Cleveland, Ohio; and Mr. S. H. Short, president, after having them thoroughly tested, says of them: "They are fully up to the standard, and we have no criticisms to make of them."

Mr. D. R. Powell, president of the St. Louis and East St. Louis Electric Railway Company, writes of them, after continued use all last winter, as being "admirably adapted for the purpose." The normal use of current per car of these heaters is only three amperes.

The Unicycle Elevated Railway.

One of the most interesting features of the recent electrical exhibition at St. Louis was a model truck of the National Unicycle Elevated Railway Company's system. The model seated two persons and ran on a short elevated track. Fig. 1 shows the construction of the track. One main rail and two guide rails are used, the main rail being supported by posts and uprights. Side braces, curved at the lower end, are bolted to the main rails, the guide rail resting in the curved part of the brace and held in position by bolts.

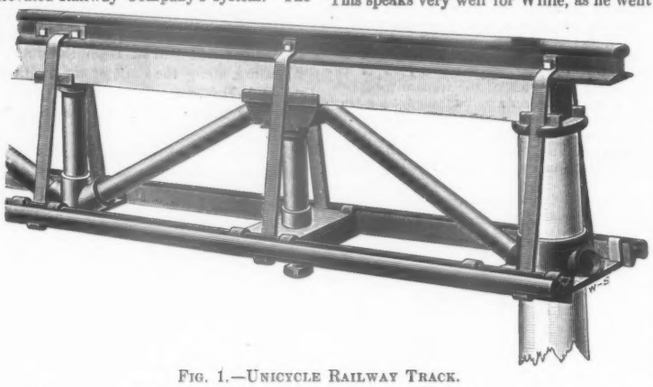

FIG. 1.—UNICYCLE RAILWAY TRACK.

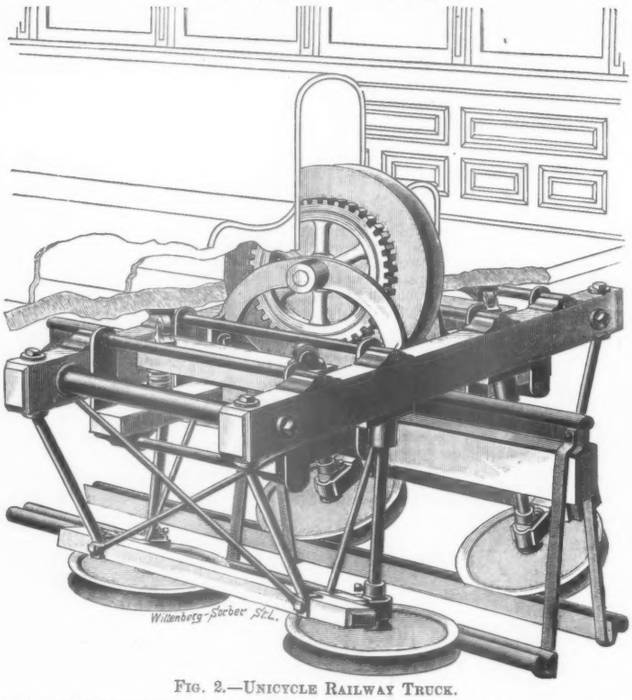

FIG. 2.—UNICYCLE RAILWAY TRUCK.

In Fig. 2 is shown the truck, the main wheel being grooved and resting on the main rail. Iron cross bars support four smaller wheels, also grooved, which fit the guide rails and hold the truck to the track. Friction rollers, resting on springs, are placed between the truck and the car bottom, enabling the car to take a very short curve easily. The inventors claim that double the highest speed known may be made on this road with safety.

The Telegraph Strikers.

The Chicago *Times*, in a long editorial on the telegraphers' strike, says that the apparent abandonment of the brotherhood by the men is a mere ruse to put the telegraph officials off their guard, to the end that a complete organization may be effected. The men sign the agreement to desert the brotherhood without the least intention of doing as they agree, excusing their double dealing with the plea that it is life or death with them, and that a pledge exacted in such circumstances has no moral force. The whole plan is said to be the suggestion of a prominent labor leader. It is intended to actively organize under the strictest secrecy, until every telegrapher in the country is in the organization, if such a complete move can be made, so that when a strike is ordered in 1892 the service will be paralyzed.

Good for Willie.

Willie Hewitt, who for some time past has been in the telegraph office in this city, was promoted recently, and will now have entire charge of the telegraph office in Tustin. This speaks very well for Willie, as he went into the office to learn telegraphy only four months since.—*Santa Anna, Cal., Press.*

The Wisconsin Telephone Company is to erect a $40,000 building in Milwaukee

An Exhibit of Crosby Batteries.

The Crosby Electric Company, 87 and 89 South Fifth avenue, this city, has a very interesting exhibit at the American Institute Fair of the dry and liquid batteries it manufactures. This exhibit is educational, because it shows the multifarious uses to which it is possible to put the modern electric battery. The exhibit is arranged to show the merits of the Crosby dry battery, the Hussey blue stone battery, the Duplex and the Eclipse batteries, all of which are manufactured and sold by the Crosby Electric Company.

A sewing machine is run very prettily by a little ⅛ horse-power Crocker-Wheeler motor. Current is furnished to the motor by two Gibson storage cells, charged from eight Hussey blue stone batteries. Two cells of Hussey battery are used to operate the motor running a revolving store fixture used in exhibiting goods. A fan motor whirls around driven by current from Eclipse cells. Two cigar lighters of novel design are energized by Crosby dry batteries. "Liberty lighting the exhibit" is personated by a stylish doll, about a foot high, clothed in blue silk and lace, holding a three candle-power incandescent lamp in her right hand, and standing under a glass case. The Eclipse battery gives current to run the lamp. A medical coil, an hotel annunciator and the bell of an alarm clock, are other applications of the current from the dry batteries.

Sweet music is given forth by a very large and handsome Paillard musical box. Hussey batteries, storage cells and an electric motor, furnish the motive power for the box. M. J. Paillard & Company, the well-known musical box manufacturers, have adopted the Crosby Electric Company's batteries for operating all their electrically controlled musical instruments.

A telephone instrument at each end of the exhibition space is furnished current by Crosby dry batteries which are especially adapted to this class of work. Dry batteries for operating a bell are cleverly concealed in vases of artificial flowers, the wires being made to represent trailing vines.

An "A. B. C." door opener is operated by one cell of Crosby dry battery which is standing up to its work bravely. "The door is opened and shut probably 5,000 times a day," said one of the men in charge. Another medical coil is in circuit with a Duplex cell and furnishes a pleasant current of electricity to the visitors who monkey with it. A large number of annunciator boxes, containing two, three, four, six, ten or more Crosby dry cells are shown. The cells are neatly enclosed in these cases and connected up, so that the purchaser who wants to use the box to operate an hotel annunciator, burglar alarm or for any similar service, has but one pair of connections to make. It is a neat scheme.

All the batteries named are exhibited in large numbers, and the interest evinced by the crowds which constantly surround the exhibit requires the undivided attention of the two gentlemen in charge.

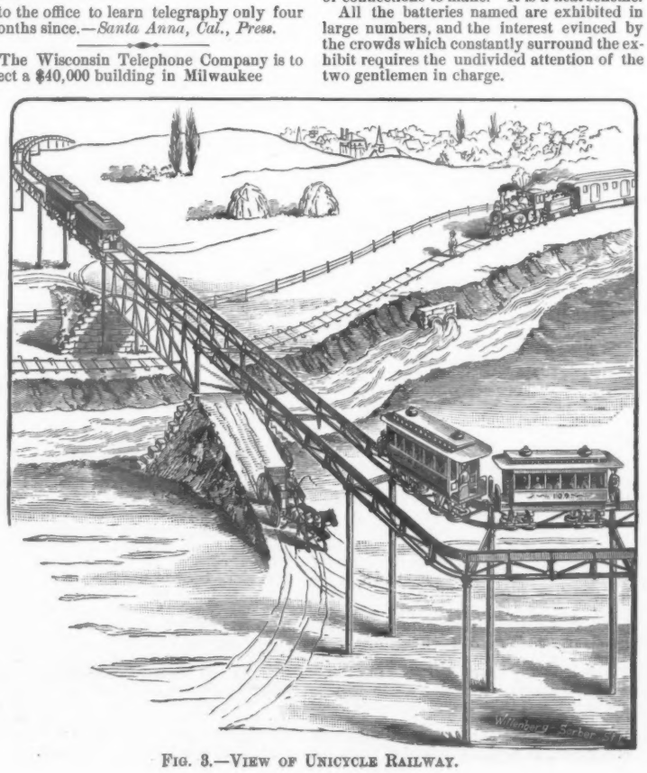

FIG. 3.—VIEW OF UNICYCLE RAILWAY.

Electric Elevator and Hoist.

The American Electric Elevator Company, of this city, has recently brought out a very compactly designed passenger elevator. One form of the apparatus is shown in Fig. 1, on this page. In this instance the motor is placed at the top of the elevator shaft, the entire machinery occupying a space only 4x6x4 feet.

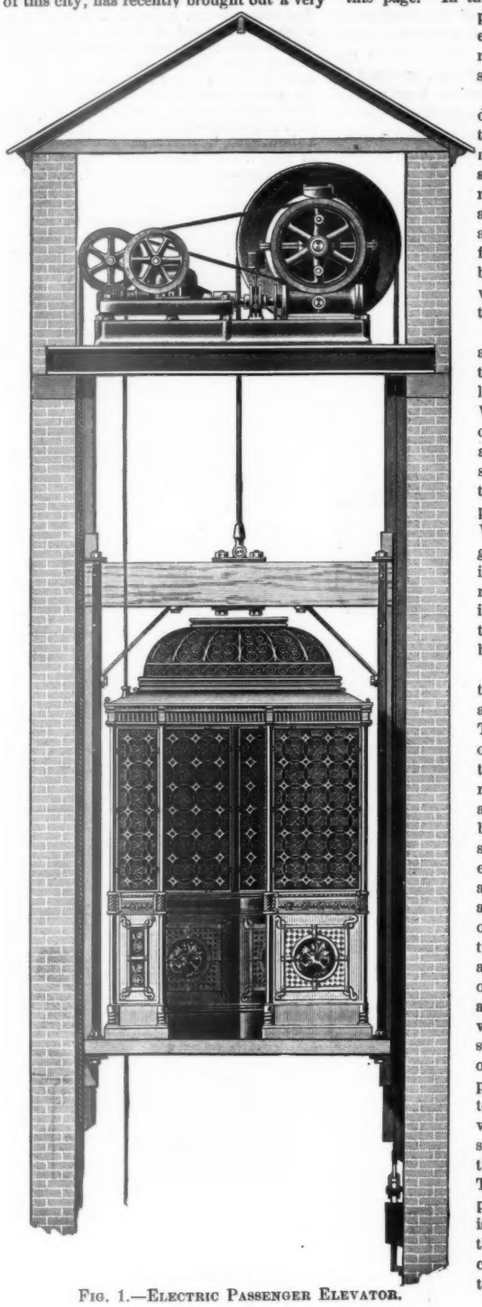

FIG. 1.—ELECTRIC PASSENGER ELEVATOR.

The winding drum is driven by an electric motor through a worm gear, the motor being controlled by a reversing switch and rheostat combined. An automatic electric brake, and an automatic device for stopping the car at the bottom and top of the elevator shaft are also part of the apparatus.

The worm shaft and armature shaft are coupled together direct, the coupling forming a brake wheel. When the current is cut off the brake is applied automatically, the brake shoes being connected to the core of a solenoid placed above the shaft. When the solenoid is energized by the current being in use, the brake shoes are released, but if the current is cut off, from any cause, the core drops and the brake is applied.

The worm gear is attached to the drum shaft and actuated by the worm. The operator starts, stops, or reverses the motion of the car by the operating rope which is attached to a wheel on the drum shaft, but unattached to it. A screw thread is cut on the end of the drum shaft, and a winged nut travels back and forth on it. When any obstruction is met, the nut turns with the drum shaft, and by a peculiar method of attachment to the operating wheel, turns the wheel just far enough to stop the motor. Collars on the shaft at the proper points to stop the car at the top and bottom of the elevator shaft form the obstructions encountered by the wings on the nut. The worm, made in one piece with the worm shaft, is of hard machinery steel; the worm gear is a bronze composition ring, fastened to a cast iron web, both running in oil. The apparatus may be quickly and conveniently installed, as it is assembled on one bed-plate.

The dock hoist, shown in Fig. 2, is operated by a 10 horse-power motor, the whole apparatus occupying a space 5 feet 10½ inches by 2 feet 9½ inches by 3 feet 7½ inches. It will be noticed that the small space occupied makes it possible to place the hoist on an overhead platform, so that no deck or dock room is occupied.

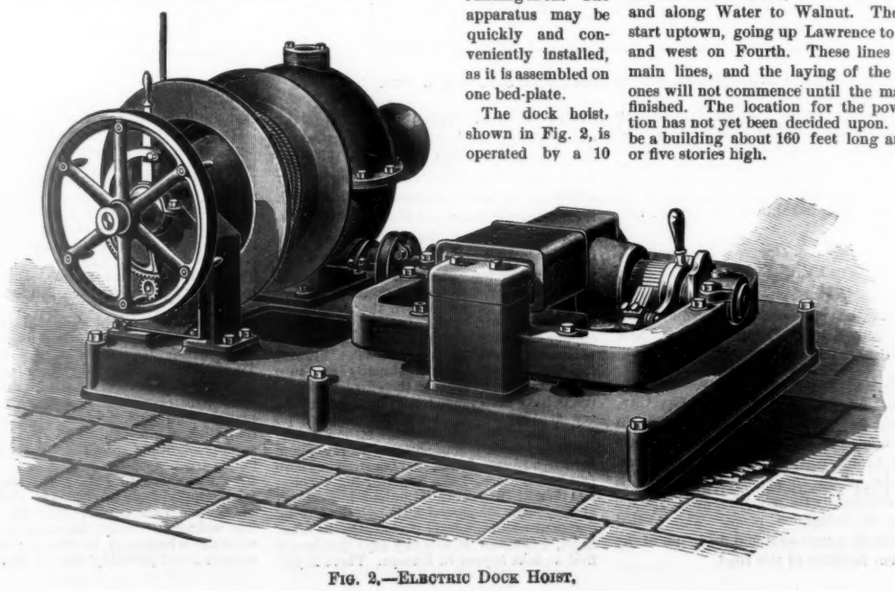

FIG. 2.—ELECTRIC DOCK HOIST.

The Thomson-Houston Electric Company does all the electrical work on these machines, the remainder of the work being done by the Trenton Iron Company. The principal offices of the American Electric Elevator Company are at 15 Cortlandt street, this city. The officers of the company are, A. S. Hewitt, president; Charles A. Coffin, vice-president; R. A. Hewitt, secretary and treasurer: George H. Reynolds, general manager.

Electric Light in New Mexico.

At a meeting of the Santa Fe Electric Light and Power Company, last week, it was decided that work on the erection of a first-class electric light plant should commence at once, and be pushed as rapidly as possible to completion. It was decided to adopt the Edison system, represented by Mr. Irving Hale, of Denver. The company has a capital stock of $25,000, which has been subscribed by C. F. A. Fisher, Hon. T. B. Catron, Mr. Webber, of Denver; J. G. Schumann, E. D. Franz and others. The company paid $12,000 for a lot on which to locate the power house.

—— At New Albany, Ind., the representative of an electric light company about to be established in that city reports that he has subscribers for 1,700 incandescent lights or their equivalent in arc lights, and states that his company will be in operation by January 1st. The old company has contracted for additions to the present plant that will cost $10,000 and will furnish electricity sufficient for 200 arc lights or 2,400 incandescent.

—— The advent of electricity as a mode of illuminating the city of Puyallup is eagerally waited. The rainy nights and cloudy skies make the atmosphere so dark that it is with the utmost caution that the pedestrian finds his way. Puyallup has outgrown the pale illumination of the candle and soon will be brilliantly illuminated with electricity, which will make night as day. Stores, too, will avail themselves of the opportunity of this powerful and perfect system of lighting, and the incandescent globe will flash upon the merchandise and in the workshop. Surely Puyallup has a brilliant future.—*Puyallup, Wash., Commerce.*

—— The conduits for the Edison Company's underground electric plant in Cincinnati are now being laid on the public landing, between Main and Sycamore. Pipes have already been laid in Pearl street from Eggleston avenue to Broadway, in Second street from the alley between Lawrence and Ludlow, down Broadway to Front, on Front east to Ludlow. The plan includes a line on Front to Main, down Main to Water and along Water to Walnut. They then start uptown, going up Lawrence to Fourth and west on Fourth. These lines are all main lines, and the laying of the smaller ones will not commence until the mains are finished. The location for the power station has not yet been decided upon. It will be a building about 160 feet long and four or five stories high.

ELECTRIC LIGHT NEWS

—— Marietta, Ohio, is illuminated by 101 arc lights.

—— Harrison, Ohio, is asking for electric light bids, to be in the city clerk's hands by December 2.

—— The Thomson-Houston Company's system will be used for lighting Cuyahoga Falls. A five-year contract has been granted.

—— The old board of directors of the Edison General Electric Company was elected at the annual meeting held in New York last week.

—— Proposals are wanted until December 19, 1890, for lighting by electricity and gas the public streets, etc., of Frankfort, Ind., for a period of five years.

—— George W. Martin, cashier of the Ironwood Electric Company, at Ashland, Wis., is reported missing, and so is several hundred dollars of the company's money.

—— The Light Committee of the York City, Pa., councils have awarded the contract for lighting the city to the People's Electric Light Company, the price being 25 cents per light per night.

—— The Brooklyn, N. Y., factory of the Fort Wayne Electric Company has been removed to Fort Wayne, Indiana. Some 25 families and as many single men moved from Brooklyn to that city at the same time. Prof. J. J. Wood will hereafter reside in Fort Wayne.

—— Greenville, Texas, has contracted for an electric light plant, to cost $15,000, and will own it herself. The contract calls for 1,000 incandescent lights for commercial purposes and 40 arc lights for street purposes. Greenville took time to consider propositions and had ten companies competing for the contract to put in the plant.

—— The *Standard*, of Woodstock, Ontario, states, in its issue of October 27, that an electric light man of that city has gone wrong. One C. A. Mohler, who had been the superintendent of the Woodstock Electric Light Company, is said to have decamped, leaving a deficit to the amount of $80. It is a rare thing to have to note such things about electric light men. Mohler had had the full confidence of his employers, and is said to have come from New York.

—— Great interest is taken in French naval circles on the possibilities of the application of electricity to naval uses. The government has taken the matter up, and proposes to institute a series of lectures for the benefit of naval officers on the theory and use of electricity. These lectures will be given by recognized experts, and will extend over a period of four months. Particular attention will be paid to the various systems of electric lighting, which four working electricians from each naval port will carefully study under the direction of the government.

—— Mr. Jas. W. Johnson, Chicago manager of the Western Isolated Lighting Department of the Thomson-Houston Company, did a very satisfactory business in new electric light plants during the past 10 days. Among these are: Schneidewend & Lee Company, Archer avenue and Halsted street, Chicago, 300 incandescent electric lights; Johnson Locke Mercantile Company, San Francisco, Cal., for the California Pumice Company, at Napa, Cal., 50 incandescent lights; Fecker Brewing Company, 871 Dudley street, Chicago, 50 incandescent lights; Chicago Anderson Common Brick Company, "Stickney Track," Town of Lyons, near Chicago, 48 arc lights; the McCormick Harvester Machine Company has placed an order with this department for a 16 arc light, second hand outfit, for blacksmith shop; Compound Lumber Company, 70 incandescent lights for Hegewisch, Ill.

Standard Wooden Mouldings.

The Independent Bung Company, 550 West Thirty-eighth street, this city, have especial advantages for filling orders for wooden mouldings for electrical purposes. The standard sizes made by this company are shown in full size in our illustrations. This company cuts its own lumber, using about 30,000 feet per day. The principal business is the cutting of bungs, although the moulding department is rapidly growing. The mills are at Elizabeth, W. Va., in the center of a very large lumber district. All kinds of wood are used in making these standard mouldings, but more poplar is used than any other kind. This is considered the best wood, irrespective of cost, because it is so susceptible to stains of all kinds. The company carries from 500,000 to 1,000,000 feet of mouldings all the time, so that they are always prepared to fill orders.

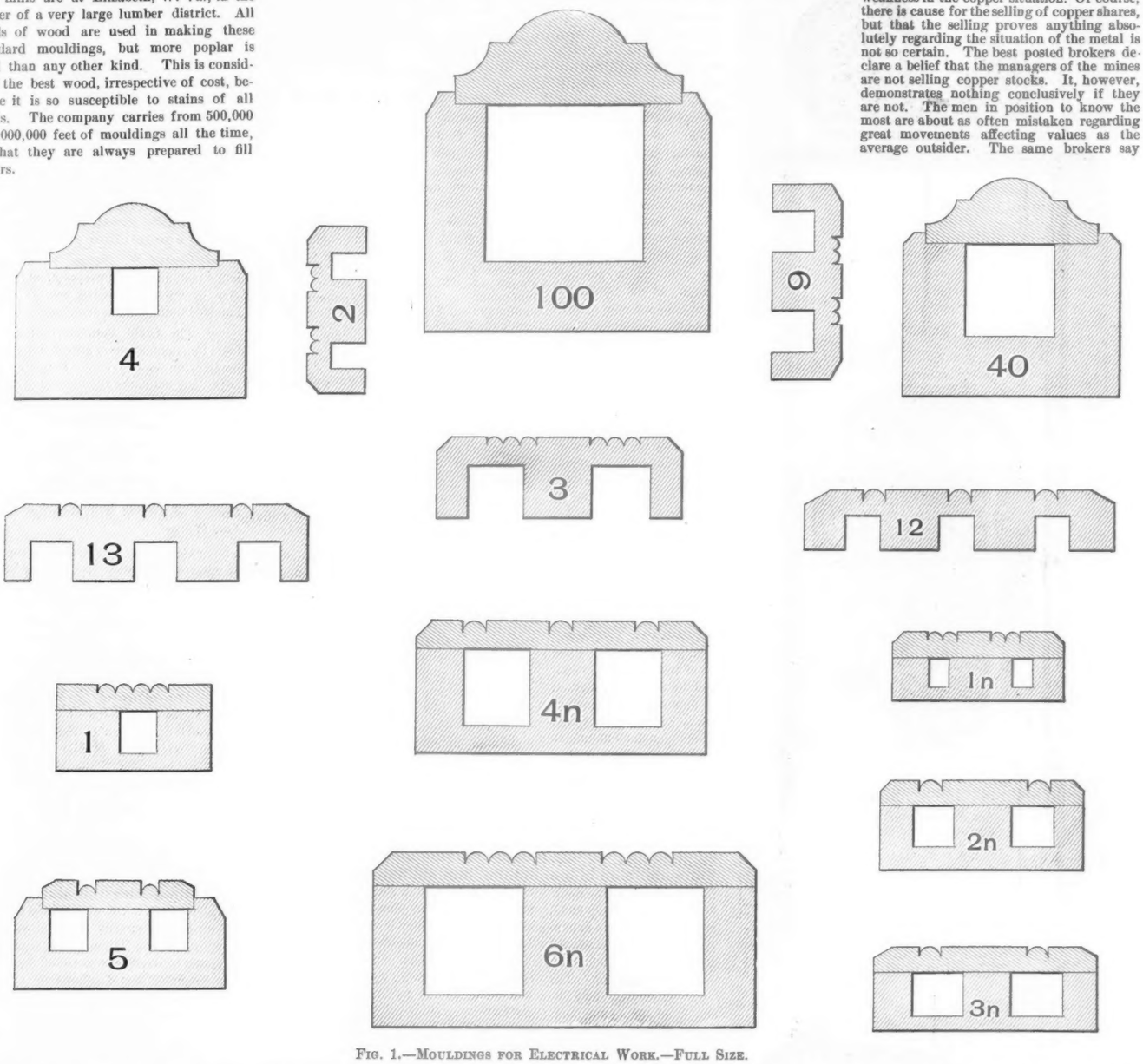

FIG. 1.—MOULDINGS FOR ELECTRICAL WORK.—FULL SIZE.

Mercury Element in Relation to Temperature.

BY F. STEINITZ.

The combination $Ag/AgSO_4/Hg_2SO_4/Hg$, which exhibits a marked change under different temperatures, seemed to the author peculiarly adapted for the study of Helmholtz's theory, that the difference between the electrical and the chemical energy of an element is equivalent to the product of the absolute temperature and the differential co-efficient of the difference of potential between the poles. If the chemical energy overcomes the electrical energy, in which case a current is generated, the co-efficient is negative; if the reverse is the case, it is positive. The elements used consisted of two glass vessels, 6.5 cm. high and 2.5 cm. wide, connected by a capillary tube. In both vessels was placed mercury, into which in the second vessel was plunged a platinum wire. On the mercury in the first vessel was placed a layer of paste of mercurous sulphate and silver sulphate, and on this the silver sulphate solution was carefully poured. In the silver sulphate solution a silver wire spiral and a thermometer were immersed. The whole was put into a copper vessel containing water.

The changes in the E. M. F. varied considerably with the time. The first reading was .0295 volt at 13.8° C. The tests at various temperatures give rise to the assumption that the E. M. F. is a linear function of the temperature. The results show that the agreement between the theory and the experiments is complete in cases of actions of a reversible nature. It would also seem that even with actions not belonging to this class the theory would lead to correct conclusions.

PERSONAL.

Mr. C. E. Newton and Mr. C. L. Tolles, of Hartford, the gentlemanly representatives of the Jewell Belting Company, were New York visitors last week.

R. S. Hair, general eastern passenger agent of the Chicago, St. Paul & Kansas City, takes the position of general passenger agent of the road, vice Mr. W. R. Busenbark, promoted to the position of assistant general manager. Both these gentlemen will be congratulated by the many friends they made among the telephone people who visited Minneapolis a year ago, and made use of the excellent facilities of this road.

The Copper Question.

The copper situation is an interesting one, and the doubt regarding it arises largely from general ignorance of the relationship of supply to demand, says a financial writer in the Boston *Herald*. There are no authentic, or even approximate, statistics of visible supply and deliveries kept in this country as there are in England, and there is no means of learning, except once a year, whether consumption is outrunning production or *vice versa*. That the market for lake copper is stagnant is obvious. The testimony is universal upon that point. On the other hand, there is evidence that casting copper is in some request. Apropos of the latter it is said that the Anaconda Company has withdrawn its stock from the market, rumor says in order to promote a sale of the mines and plant in London. If this is true, it would give reason for a firmer market for casting than for lake copper, which there evidently is. The New York *Bulletin* says: "The copper situation is wholly unchanged. The periodical rumors of 'bankers' sales' are still floating around and occasionally get into print; but, like others to the effect that contracts have been made for all next year delivery at 12½ cents, those rumors have no foundation. In fact, they are strongly suggestive of stock jobbing literary work. There is little business doing, and consumers manifest indifference. Lake Superior ingot would be taken at 16½ cents but outside lots offered at 16¾ cents are passed, although the mining companies still quote 17 cents. On the other hand, a German in this city says that he can find no lake copper in Europe. There is gossip and has been gossip that the Calumet and Hecla is piling up a surplus of copper, and would be glad to sell at a concession from 17 cents. What responsibility attaches to this rumor is not known. Having bought copper well ahead of current wants some months ago, consumers have had little need to buy more, but should be in the market again soon. It is a theory worth considering that consumers are induced to hold off from purchasing in part because of the decline in copper mining shares, arguing, with a show of logic, that these would not decline as they have unless there was a chronic weakness in the copper situation. Of course, there is cause for the selling of copper shares, but that the selling proves anything absolutely regarding the situation of the metal is not so certain. The best posted brokers declare a belief that the managers of the mines are not selling copper stocks. It, however, demonstrates nothing conclusively if they are not. The men in position to know the most are about as often mistaken regarding great movements affecting values as the average outsider. The same brokers say that, in this instance, the mine owners are left with the stocks on their hands. Who, then, have been sellers of copper stocks, and why have they sold? Margin holders have sold because their brokers have called for more margin. The great buying of copper stocks was in anticipation of high prices for the metal. The theory was that purchasers on the rise to 17 cents for lake would yield handsome profits on the further rise to 20 cents. The further rise did not come. The incentive to further buying ceased when the halt was made at 17 cents. Would-be buyers were fully supplied. Tight money made the purchasers feel heavy. A little profit taking or short selling brought a decline in prices. The brokers commenced calling for margins. Stop orders were reached, and this precipitated a further decline and other calls for margins and further sales, and so it had gone on until the present. The absence of consumers of copper from the market has given the market a weak appearance. It looks for the moment, in truth, as if the price of lake copper had reached the meridian at 17 cents. This may or may not be true. The selling of mining shares does not demonstrate whether it is true or not. Consumers could probably buy all they want at

that price and for less rather more, and, with the temper of the situation rather bearish on the metal, the growth of production comes as a depressing factor. If consumption develops sufficiently to lift the metal to a higher price level, mining shares will naturally recover some of the lost ground and the rise and fall may come again. But if 17 cents proves the highest price in this general movement, top prices for copper stocks have probably been recorded. Solve the law of the relationship of supply and demand appertaining to the metal, and the vexed problem of the probable course of share values will find an answer. The money factor is an important one, but it lasts only while money is close. The greater law of supply and demand is always operative, and, as remarked in the beginning, statistical information showing the operation of this law is deficient in the United States. In Europe copper is weak on the long continued reign of dear money. It even counteracts the increase of consumption over production.

An interesting fact regarding electrolytic copper came to notice recently. It is declared to have conductivity of lake copper, but is deficient in tension, five per cent. being lost from sagging when it is stretched upon poles.

The Quincy mine produced 450 tons of mineral during October, against 450 tons during September, and the same number of tons during October last year. For 10 months the production amounts to 4,097 tons, against 2,963 tons in 1889, an increase of 1,134 tons. The above does not include odd pounds. The actual increase in ten months of this year over last year is 2,180,695 pounds of mineral.

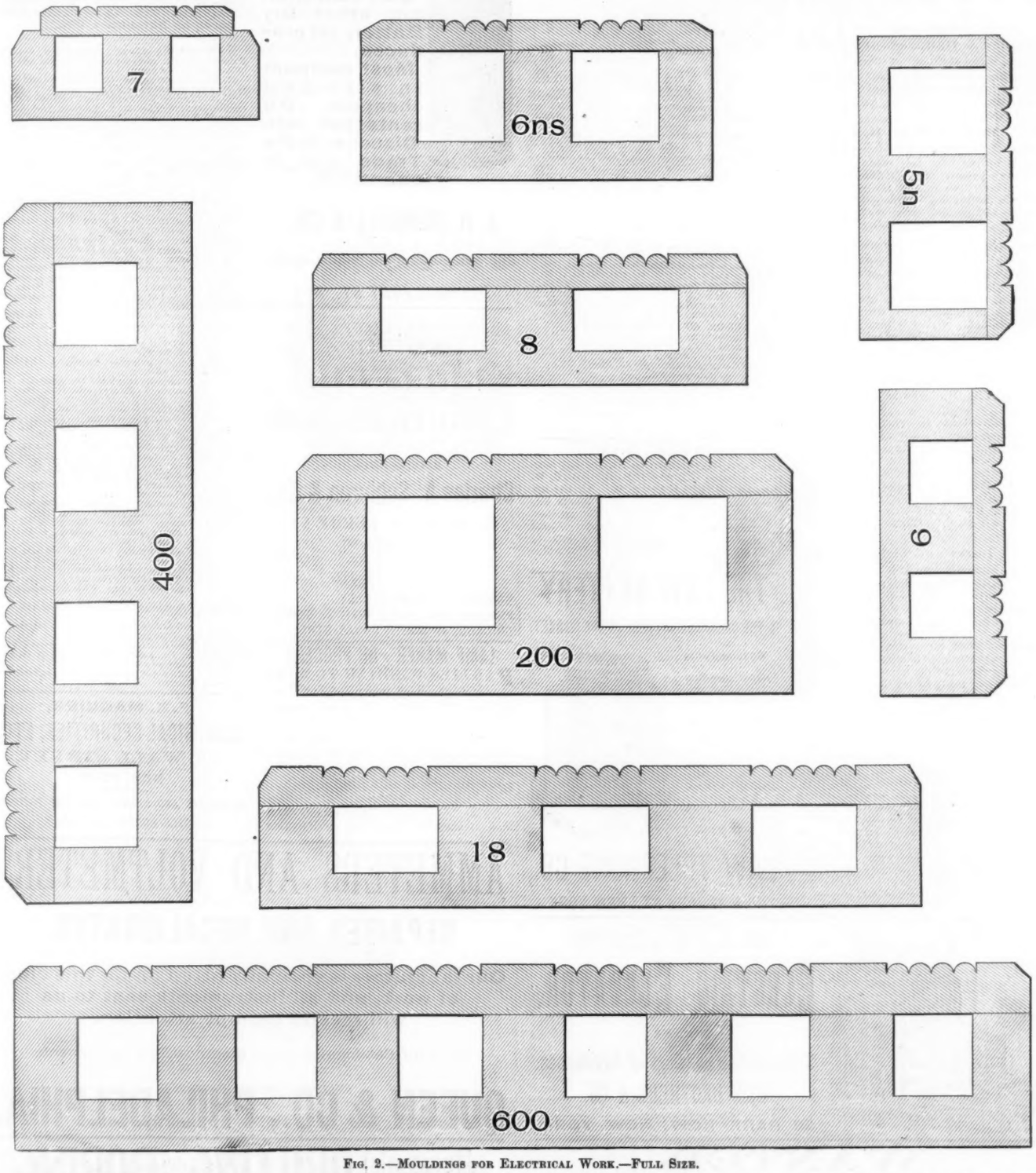

FIG. 2.—MOULDINGS FOR ELECTRICAL WORK.—FULL SIZE.

Transformer Efficiency.

A rough test for arriving at the efficiency of a transformer appears in a recent number of *Industries*. The primary current is to be measured when the secondary is open, by an alternating current ammeter, and the volts are to be read on a suitable voltmeter such as is always to be found in stations. Half the products of the volts into the current is said to give the loss in the iron. The loss in the copper at any load is calculated from the product of the resistance into the square of the current. An example is given from an efficiency of 85.9 per cent., the value for the same transformer, according to Professor Ryan, being 86.3 per cent. The rough method, says the writer, gives the loss in the iron well within 10 per cent., that is to say, gives the efficiency within 1 per cent. This appears at first to be too good to be true, and does not bear any external evidence of the why and the wherefore. We understand, however, that it is arrived at by considering that the area of the well-known hysteresis curve for low magnetizations is approximately one-half of that of the rectangle formed by its limiting co-ordinates. The London *Electrician* says that in the curves that they have examined with this feature in view, they find that the error is very considerably more than 10 per cent.

How is this for a Rapid Transit Scheme?

Two German engineers propose rapid transit by means of three continuous platforms moving along the streets side by side. The lowest of these platforms is four inches high and moves at a uniform speed of five feet per second. Any ordinary pedestrian can, they state, mount this platform from the ground without difficulty, and from this he can with equal ease step onto a second platform four inches higher than the first and moving twice as fast. The passenger thus acquires a speed of ten feet per second and, stepping to the third platform in the same way, he is carried at a speed of 15 feet per second, or ten miles per hour, to his destination, where he steps off by degrees, as he got on.

The new consolidated street railway company, of Grand Rapids, Mich., has bought the Reed Lake Electric Railroad, and now owns everything in the street railway line in the city.

KINDRED INTERESTS

The New England Butt Company, of Providence, are just now filling large orders for their well-known wire braiding machinery. An enlargement of their plant is contemplated.

Stanley & Hall, electrical house furnishings, 32 and 34 Frankfort street, this city, are sending out to their friends a neat little six inch, folding, celluloid pocket rule. It is a clever advertising idea, and a useful pocket piece.

The Maddox Wire Belt Company, of Saccarappa, Me., is sending out samples of the wire belt made under the company's patents. It is a fibre belt with wire cables woven in, and the whole filled with a waterproofing compound. Judging from the sample and testimonials sent with it, this is a good and cheap belt.

Pass & Seymour, Syracuse, N. Y., announce that they have succeeded in producing a china for electrical insulators much stronger than ordinary china. This toughened china is obtained by the use of certain chemicals in combination with ordinary china producing materials that in the process of mixing and baking effect a toughening of the entire mass. It is said to be possible to rivet brass to this china.

The Gate City Electric Company, of Kansas City, Mo., who have recently increased their capital, have greatly added to their already large and complete stock of Okonite and Candee wires, and report their volume of trade very rapidly increasing throughout the South and West. One of their recent contracts taken is for 60 miles of Candee "the king of weather-proof wires," for the Thomson-Houston Electric Company, of Joplin, Mo., in the face of competition from New York City, Chicago, St. Paul and St. Louis.

J. F. Barry and Thomas J. McTighe, composing the firm of J. F. Barry & Co., whose principal office is at 54 William street, in this city, have been appointed constructing engineers in sole charge of the new electric system of street railways at Lincoln, Nebraska. The syndicate who have purchased the street car system in the city of Lincoln, have decided to alter the method of propelling the cars from horses to electricity, and are about ready to let the contracts for the same. A power plant of about 400 horse-power will be at once erected, and it is intended by the owners to make this one of the most modern and thoroughly equipped plants in this country. Heavy rails, mostly of the girder pattern, will be laid and 30 motor cars will be the first installment. Special care will be taken also in the overhead construction, and some new and valuable features will be introduced. Lincoln now has a population of about 58,000 and is rapidly growing. About 35 miles of track is now being operated, and under the new installation this will be largely increased. All work of designing and construction has been placed in the hands of J. F. Barry & Co., electrical and mechanical engineers, of New York.

FINANCIAL.

Closing quotations of electric stocks, from F. Z. Maguire & Co., Electrical Securities, 18 Wall street, N. Y., Saturday, November 8, 1890. New York, Boston and Washington Stock Exchanges. Pittsburgh closing November 7, 1890.

NEW YORK.	
Western Union Telegraph Co.	79⅛
American Telegraph & Cable	88.
Central and South American	155.
Mexican	208.
Commercial Cable Co.	101¼
Postal Telegraph Cable	39.
Edison General Electric Co.	90.
" " " Deferred	82.
Consolidated Electric Light	
Edison Electric Illuminating Co.	67.
United States Electric Light	30.
North American Phonograph	35.
BOSTON.	
Thomson-Houston Electric Co.	46.
" " " Preferred	97.
" " " Series C	11¼
" " " Series D	6⅝
" " International Co.	
" Welding Co.	185.
" European Welding Co.	
Ft. Wayne Electric Co	12½
PITTSBURGH.	
Westinghouse Electric Mfg. Co.	26¼
TELEPHONE:	
American Bell	220.
Erie	48¾
New England	51½
Mexican	77⅞
Tropical American	
MISCELLANEOUS:	
Edison Phonograph Doll	2.
WASHINGTON.	
Pennsylvania Telephone	26.
Chesapeake and Potomac	68¾
American Graphophone	13½
United States Electric Light (Washington)	150.
Eckington and Soldiers' Home Electric Ry.	60.
Georgetown and Tennallytown	48.

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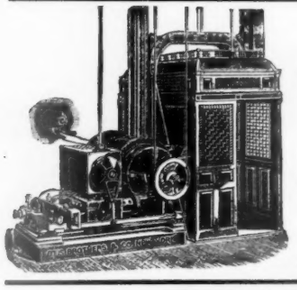

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON NOVEMBER 4, 1890.

439,662 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Electric Car Co. of America, same place.
439,724 Electric heater; Chas. W. Drew and Edw. R. Francis, Minneapolis, Minn.
439,746 Trolley line switch for overhead electric conductors; William L. R. Emmet, East Rockaway, N. Y.
439,775 Electric motor and generator; Alfred Gartner, Newark, N. J., assignor, by mesne assignments, to Albert A. Schmidt, same place.
439,838 Electric actuating device for pendulum clocks; John H. Dyson, Mazomaine, Wis., assignor of one-half to Herman O. Wetherell, same place.
439,840 Electric log; William P. Granville, Stroud Green, County of Middlesex, England.
439,850 Secondary battery plate; Albert E. Woolf, New York, N. Y.
439,859 Magazine fuse box for electric circuits; William Fr. Bossert, Ilion, N. Y.
439,867 Electric railway; Mark W. Dewey, Syracuse, N. Y., assignor to the Dewey Corporation.
439,904 Electric arc lamp; Harold C. Shubert, Chicago, Ill., assignor to the Western Electric Co.
439,916 Device for applying a coating to electric conductors; James T. Whittlesey, Lynn, Mass.
439,929 Method of and apparatus for connecting dynamos; Chas. T. Child, Brooklyn, N. Y.
439,939 Rheostat; Edwin R. Gilbert, Hartford.
439,959 Telegraph key; William A. J. Kohn, San Francisco, Cal.
439,974 Electrical generator; Frederick L. McGahan, Indianapolis, Ind.
440,013 Electric indicator; Leston O. Chatfield, Benton Harbor, Mich.
440,016 Automatic regulator for dynamos and motors; Fremont J. Cleaver and Geo. Fassold, Pittsburgh, Pa.
440,023 Electrode for secondary batteries; Justus B. Entz, New York, and William A. Phillips, Schenectady, assignors to the Waddell-Entz Electric Co., New York, N. Y.
440,024 Method of making electrodes for secondary batteries; Justus B. Entz, New York, and William A. Phillips, Brooklyn, assignors to the Waddell-Entz Electric Co., New York, N. Y.
440,042 Insulators for electric conductors; William Kessler, Lafayette, Ind.
440,046 Automatic replating mechanism for phonographs; Jacob H. Ling, Detroit, Mich.
440,070 Magnetic separator for grain; Ewald Von Syo, Angsling, Germany, assignor to Phillipp Adam Tafel.
440,071 Electric heater; Chas. H. Talmage, Kansas City, Mo.
440,091 Holder for telephone receivers; Frank T. Tinning and William K. S. Tinning, Toronto, Can., assignor of one-fifth to Chas. Warren Irwin, same place.
440,096 Telephone; Sigmund Bergmann, New York, N. Y.
440,106 Adjustable trolley and guard for electric wires; Lewis S. Hoyt, Boston, Mass.
440,115 Electrical burglar alarm; Francis Pierce, Philadelphia, Pa., assignor of one-half to William J. Philips, same place.
440,118 Automatic toll system for telephone pay stations; Howard C. Root, Brooklyn, N. Y.

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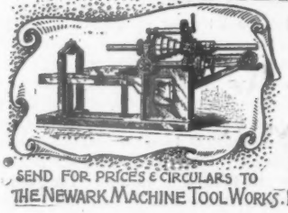

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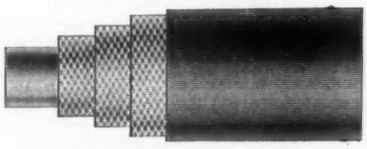

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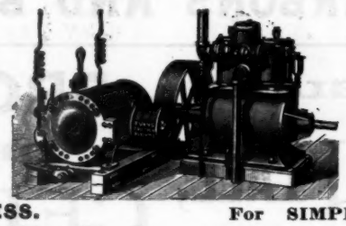

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C	8	.....	.....	.....	6.5	1½	5,000 FEET PER MINUTE.	530
.....	.....	10	.....	.....	6.3	1½		530
.....	.....	.....	.....	25	8.0	2		530
E	16	.....	.....	.....	12.0	2½		780
.....	.....	20	.....	.....	12.5	2½		780
.....	.....	.....	26	.....	13.0	2½		780
F	20	.....	.....	.....	15.0	3		990
.....	.....	25	.....	.....	15.6	3		990
.....	.....	.....	32	.....	15.0	3		990
G	.....	.....	.....	50	16.0	3		990
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C	.....	35	.....	.....	21.0	4	5,000 FEET PER MINUTE.	1,360
.....	.....	.....	45	.....	21.0	4		1,360
.....	.....	.....	.....	70	21.0	4½		1,360
D	40	.....	.....	.....	29.7	6		1,750
.....	.....	50	.....	.....	30.0	6		1,750
.....	.....	.....	64	.....	29.5	6		1,750
H	52	.....	.....	.....	38.0	8		2,290
.....	.....	65	.....	.....	38.6	8		2,290
.....	.....	.....	83	.....	38.0	8		2,290
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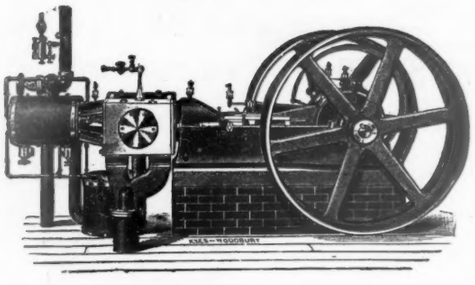

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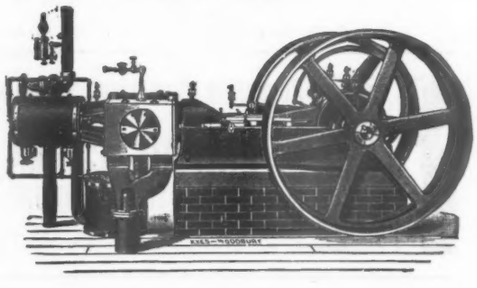

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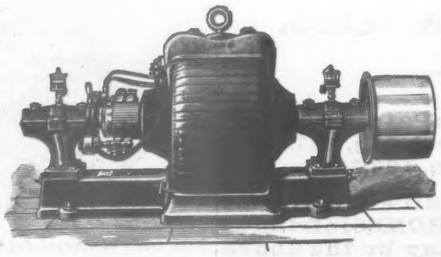

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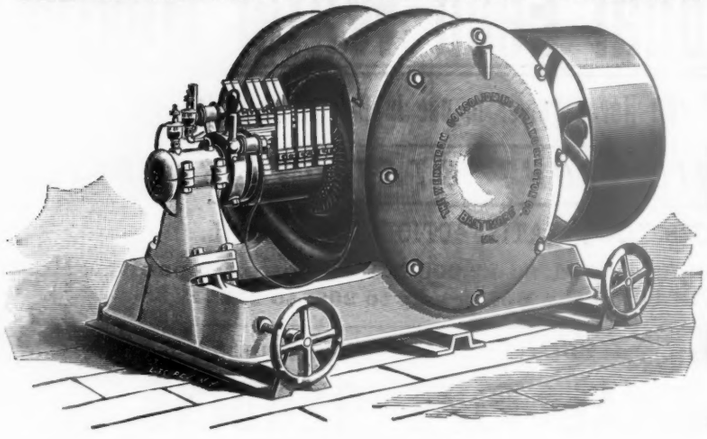

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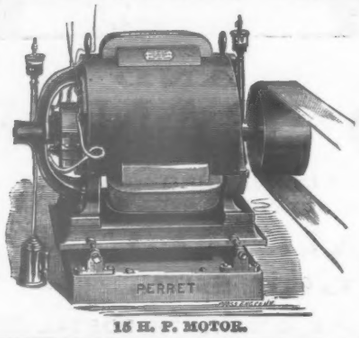

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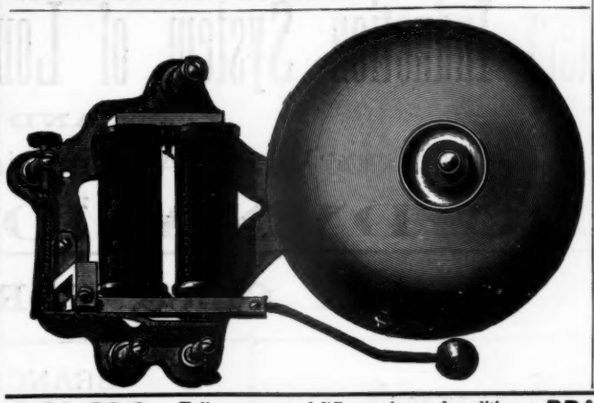

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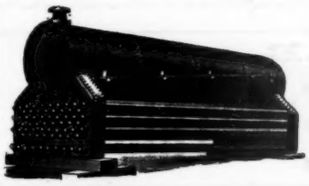

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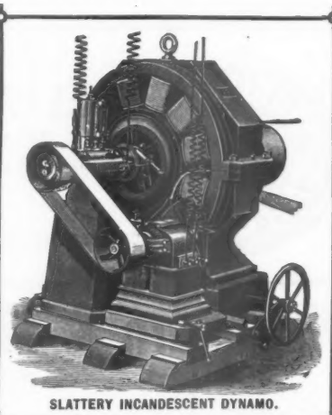

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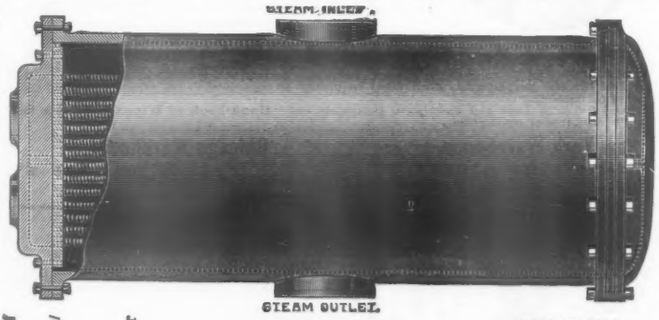

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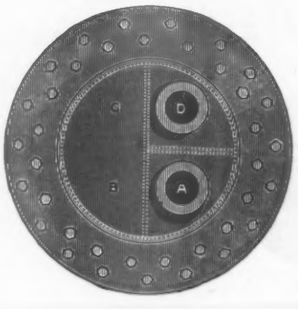

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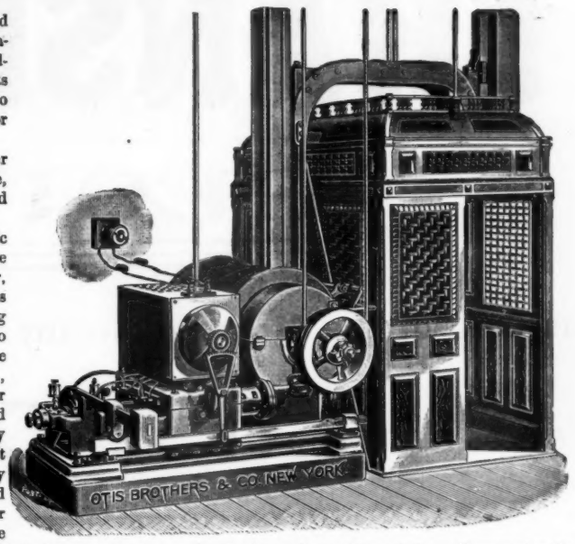

WITH the rapid introduction of electric light and power stations into nearly every city and town in the civilized world, a source of power of unsurpassed cheapness and great reliability has been made available for the performance of work needed for domestic service in buildings of every description; yet, notwithstanding the many advantages of this motive power, its safety, simplicity, extraordinary efficiency, the absence of noise, smell, smoke, ashes and heat, also freedom from liability to damage by frost or by unskilled attendance, its adaption for elevator service presented many difficulties.

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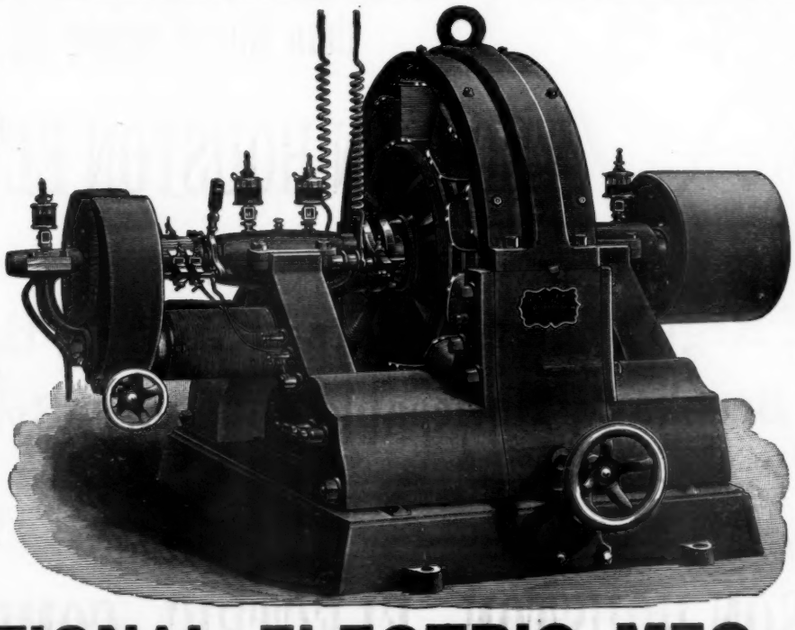

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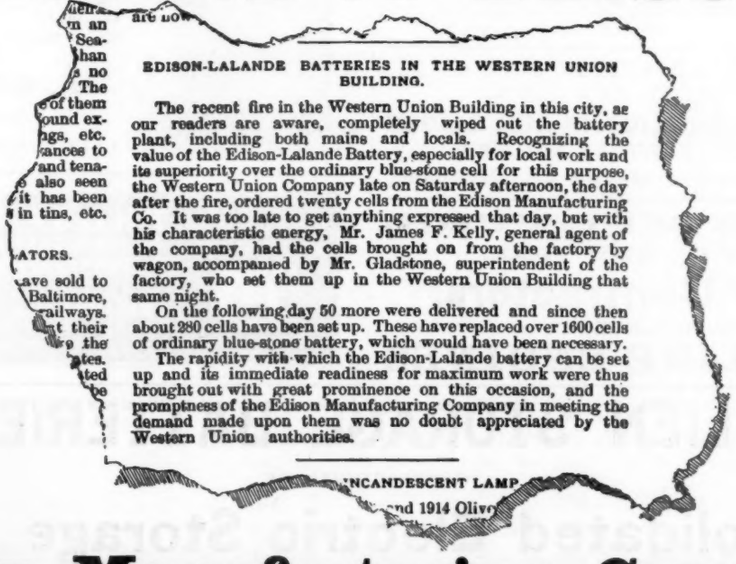

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The recent fire in the Western Union Building in this city, as our readers are aware, completely wiped out the battery plant, including both mains and locals. Recognizing the value of the Edison-Lalande Battery, especially for local work and its superiority over the ordinary blue-stone cell for this purpose, the Western Union Company late on Saturday afternoon, the day after the fire, ordered twenty cells from the Edison Manufacturing Co. It was too late to get anything expressed that day, but with his characteristic energy, Mr. James F. Kelly, general agent of the company, had the cells brought on from the factory by wagon, accompanied by Mr. Gladstone, superintendent of the factory, who set them up in the Western Union Building that same night.

On the following day 50 more were delivered and since then about 280 cells have been set up. These have replaced over 1600 cells of ordinary blue-stone battery, which would have been necessary.

The rapidity with which the Edison-Lalande battery can be set up and its immediate readiness for maximum work were thus brought out with great prominence on this occasion, and the promptness of the Edison Manufacturing Company in meeting the demand made upon them was no doubt appreciated by the Western Union authorities.

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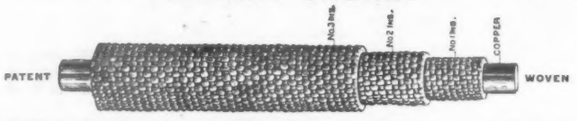

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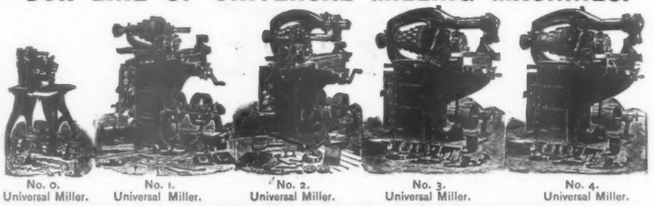

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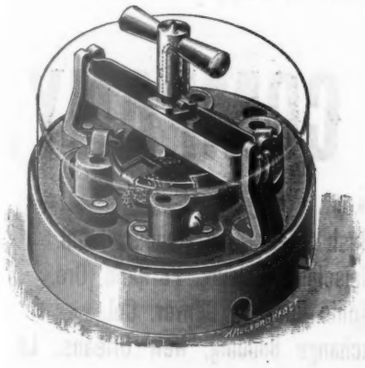

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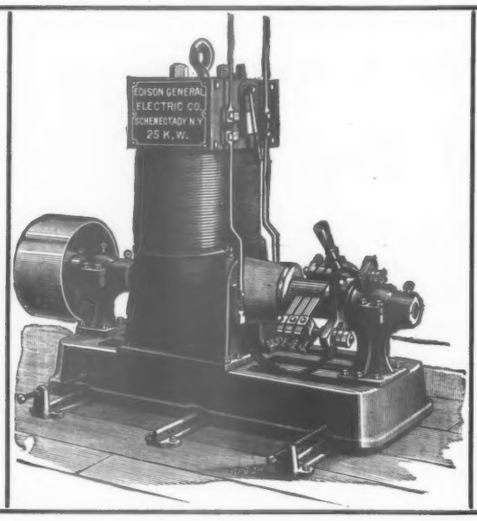

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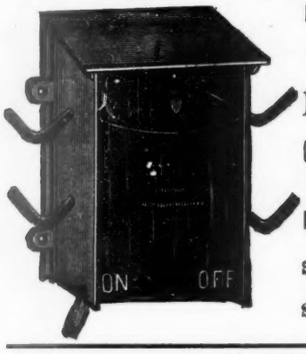

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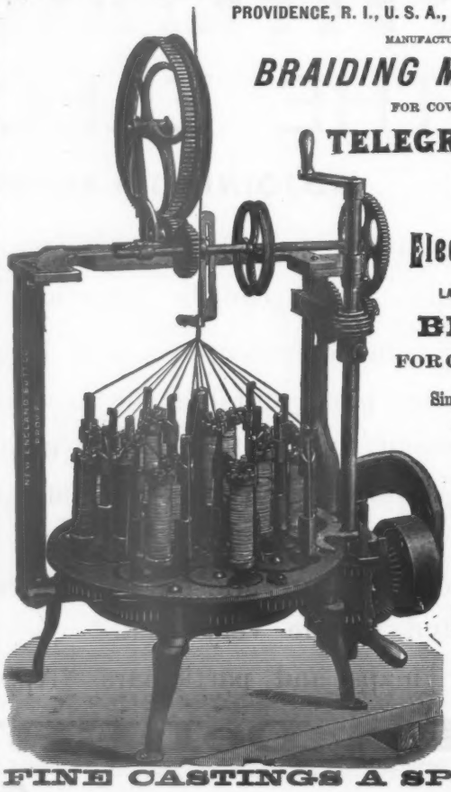

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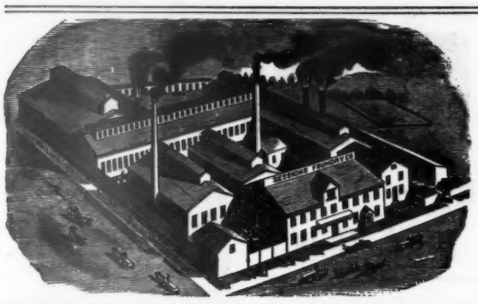

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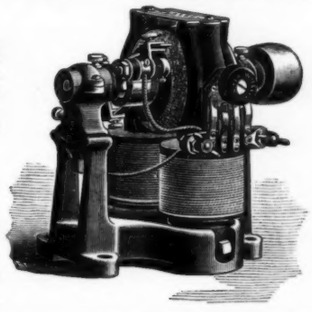

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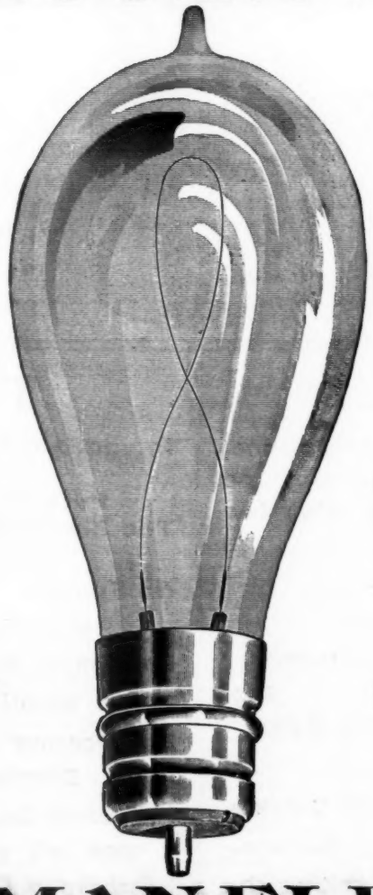

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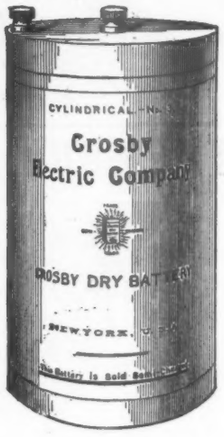

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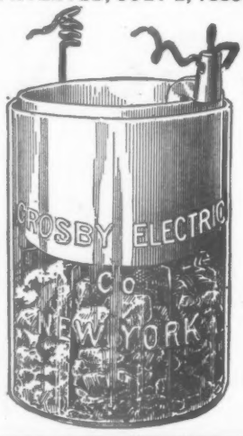

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